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OVERSIGHT OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY

HEARING

BEFORE THE

SUBCOMMITTEE ON
SCIENCE, RESEARCH AND TECHNOLOGY

OF THE

COMMITTEE ON
SCIENCE, SPACE, AND TECHNOLOGY
HOUSE OF REPRESENTATIVES

ONE HUNDREDTH CONGRESS

SECOND SESSION

FEBRUARY 17, 1988

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[*] Ranking Republican Member.

CONTENTS

WITNESSES

February 17, 1988: Page
- Dr. William R. Graham, Director, Office of Science and Technology Policy 6
- Dr. Edward E. David, president, EED, Inc.; Dr. Donald Hornig, director, interdisciplinary programs in health, Harvard School of Public Health, and Dr. John P. McTague, vice president, Ford Motor Co 44
- James Beggs, former Administrator, National Aeronautics and Space Administration; Dr. H. Guyford Stever, former Director, National Science Foundation, and Dr. Donald S. Fredrickson, former Director, National Institutes of Health and member of the White House Science Council 84
- William T. Golden, president, New York Academy of Sciences; Dr. S.J. Buchsbaum, executive vice president, AT&T Bell Laboratories; Dr. George Bugliarello, president, Polytechnic University, New York, and Dr. Frederick C. Leavitt, director, government science relations, Dow Chemical 103

APPENDIXES

I. Staffing levels at OSTP 171
II. Additional statements for the record 177
III. Congressional Research Service report, "Analysis of the Office of Science and Technology Policy", February 10, 1988 205

OVERSIGHT OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY

WEDNESDAY, FEBRUARY 17, 1988

House of Representatives,
Committee on Science, Space, and Technology,
Subcommittee on Science, Research and Technology,
Washington, DC.

The subcommittee met, pursuant to call, at 9:35 a.m., in room 2325, Rayburn House Office Building, Hon. Doug Walgren (chairman of the subcommittee) presiding.

Mr. **Walgren**. Let me call us to order and begin.

This morning we will examine the operation of the Office of Science and Technology Policy, particularly in light of the mandate which created that office in 1976. In a sense, this is almost a first oversight hearing on OSTP in the House of Representatives, and our intention is to look at the performance of this office over the scope of its lifetime and to consider whether further legislative action is needed to strengthen its effectiveness.

As most of you here know, legislation to establish OSTP was enacted following President Nixon's decision in 1973 when he eliminated the science advisory apparatus which had developed within the Executive Office of the President during the Truman, Eisenhower, and following administrations.

This action aroused real concern in many because of the issues of national importance which confront the Federal Government related to science, such as national security, health, environment, the economy—all those and all of which contain scientific and technological considerations.

Consequently, Congress proceeded to reestablish a formal type of mechanism to try to tie together the scientific and technical community to the process for policy and program development in the White House.

That legislation in 1976, which created OSTP, was developed in close coordination with the Ford administration, in order to develop an organizational structure that would be acceptable to the White House. In addition to creating the means for providing day-to-day science advice, much of the purpose of the committee was attempting to—to realize—was to institutionalize the process for making long-term assessments of developments and trends in science and technology, in order to assure the development of appropriate long-term Federal R&D commitments.

In addition, OSTP was expected to provide coordination of Federal research and development programs within the executive branch and to play a significant role in the annual formulation of the budgets related to science, research and development. The Congress clearly had high hopes for OSTP.

The question this morning is to what extent these hopes have been realized. Clearly, no legislation can compel a particular President to accept or to act upon the suggestions or counsel from his Science Adviser.

But the question is, are there arrangements for institutionalizing the science advisory function that may have a greater probability of success than those that we are currently working with?

And are there better ways to assure coordination among Federal R&D programs and to provide the kind of assessments that were originally intended, and still seem compelling, in order to formulate the most effective long-term science and technology policy?

We are pleased to have this morning a distinguished group of witnesses.

I think before introducing them and calling them to the table, I would like to recognize the ranking minority member of the committee, Mr. Boehlert from New York, and other members who are here, for comments they would like to make at this point.

[The prepared statement of Mr. Walgren follows:]

OPENING STATEMENT OF HON. DOUG WALGREN (D-PA)

This morning we will examine the operation of the Office of Science and Technology Policy in light of the legislative mandate which created the Office in 1976. This will be, in fact, the first oversight hearing on OSTP by any Committee of the House of Representatives. Our intention is to look at the performance of the Office over its entire lifetime and to consider whether further legislative action is needed to strengthen its effectiveness.

Legislation to establish OSTP was enacted following President Nixon's decision in 1973 to eliminate the science advisory apparatus which had grown up within the Executive Office of the President during the Truman and Eisenhower administrations. This action was viewed with concern by many because the issues of national importance which confront the Federal Government, such as national security, health, the environment, and the economy, contain scientific and technological considerations. Consequently, Congress proceeded to re-establish a formal mechanism to link the scientific and technical community to the process for policy and program formulation in the White House.

The legislation which created OSTP in 1976 was crafted in coordination with the Ford administration in order to arrive at an organizational structure acceptable to the White House. In addition to creating the means for providing day-to-day science advice, the Committee attempted through OSTP to institutionalize the process for making long-term assessments of the trends in science and technology, so as to ensure the formulation of appropriate federal R&D programs. Finally, OSTP was expected to provide overall coordination of R&D programs within the Executive Branch and to play a strong role in the annual formulation of R&D budgets.

The Congress clearly had high hopes for OSTP. We shall try to discover this morning to what extent these hopes have been realized or are realizable within the existing structure. Clearly, no legislation can compel a President to accept or to act upon suggestions and counsel from his science advisor. But are there arrangements for instituting the science advisory function that may have a higher probability for success than those currently in place? And are there better ways to ensure coordination among federal R&D programs and to provide the assessments required in formulating effective long-term science and technology policy? We intend to explore these questions this morning.

We are pleased to welcome a distinguished group of witnesses to this hearing. Our lead-off witness is Dr. William Graham, current Director of OSTP. We will next have a panel of former science advisors from the Johnson, Nixon, Carter and Reagan administrations. Then we will hear from several former heads of the principal R&D funding agencies of the Federal Government. Finally, representatives from industry and academe who have been closely involved with the issues surrounding science advice to the President will share their views with the Committee.

Mr. BOEHLERT. Thank you, Mr. Chairman.

I am pleased we are having this hearing because OSTP should be playing a central role in many of the issues on which this committee has been focusing.

For example, we've examined the funding and organization of the U.S. effort to develop high-temperature superconductors. We've questioned what the government role should be in aiding indusrial research, most immediately in the field of superconductors—semiconductors.

We've pressed for sterong, interagency efforts to study global climate changes and to develop a high speed computing network. We've grappled with setting spending priorities in an era of big science and small budgets, and at a time when major demands are being put on both civilian and defense R&D.

These questions transcend the narrow boundaries of any single agency and their answers will have an impact on all Americans, not just a handful of scientists and engineers.

In these areas and in many more, active, visible White House involvement in the design and implementation of policy is critical.

Our focus today is not on the specific issues I've enumerated, but rather on the structural question underlying them: Is the White House organized to allow the most effective Presidential involvement in science and technology policy? What, if anything, needs to be done to promote better planning and coordination?

Many of the noteworthy scientific and technological triumphs of recent decades—the lunar landing, the post-Sputnik surge in education programs, to take two examples—these efforts had support and direction from the highest levels of this Government.

Was that a result of some particular institutional structure? Or did it result from a happy blend of personalities, the nature of the particular challenges or mere accident?

I hope the experience of our distinguished witnesses will help us sort out these factors.

Thank you.

[The prepared opening statement of Mr. Boehlert follows:]

OPENING STATEMENT OF HON. SHERWOOD BOEHLERT (R-NY)

Mr. Chairman: I'm pleased we're having this hearing because OSTP should be playing a central role in many of the issues on which this committee has been focusing.

For example, we've examined the funding and organization of the U.S. effort to develop high-temperature superconductors. We've questioned what the Government role should be in aiding industrial research, most immediately in the field of semiconductors. We've pressed for strong, interagency efforts to study global climate changes and to develop a high speed computing network. We've grappled with setting spending priorities in an area of big science and small budgets, and at a time when major demands are being put on both civilian and defense R&D.

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I hope the experience of our distinguished witnesses will help us sort out these factors.

Thank you.

Mr. WALGREN. Thank you, Mr. Boehlert.

I recognize other members who would like to make comments. Mr. Brown?

Mr. BROWN. Mr. Chairman, may I insert at this point a statement in the record, and I will spare you the pain of listening to it?

Mr. WALGREN. Without objection, that will be the order.

[The prepared opening statement of Mr. Brown follows:]

OPENING STATEMENT OF HON. GEORGE E. BROWN, JR. (D-CA)

The Congress created the Office of Science and Technology Policy (OSTP) in 1976 as a result of concern about the importance of technical advice to the Executive Branch and as a way to formalize the presentation of technical and scientific matters. However, those hopes have not been fulfilled and the office has been a disappointment. The intent of the Congress was to provide for an eminent person with the highest scientific credentials to serve as Science Advisor.

This individual would provide the President with a balanced and well-reasoned assessment of scientific and technical programs, and serve as an active member of the executive policymaking team. The Science Advisor would not only serve as a representative of the scientific community, but would also mediate the conflicting demands of federally sponsored research and development programs.

As examples of the failure of the Congress' intent, consider the following. The Strategic Defense Initiative is the largest and most ambitious scientific research program ever proposed. Yet, Dr. George Keyworth, President Reagan's first Science Advisor, was notified of the existence of this program only five days before the President announced it on national television. Dr. Keyworth's cautionary advice was completely ignored.

When President Reagan was briefed on superconductivity, it was not the Science Advisor who did the briefing. It was Dr. Edward Teller, who is better known for his work on nuclear weapons design than on superconductivity. Dr. Teller's relationship with the President is such that he is often referred to as the "de facto" Science Advisor.

At the present time, the Science Advisor has turned the direction of information transmission completely on its head. Instead of providing advice and findings on the technical feasibility of various proposals to the President, the Science Advisor has become an advocate for the Administration's positions. The last thing this country needs is a "science press secretary or technology cheerleader."

I would hope that the position of science advisor could be elevated—and perhaps split into two positions. My first recommendation would be to re-establish the President's Science Advisory Committee (PSAC) created by President Eisenhower and disbanded by President Nixon. This Committee would be chaired by an eminent member of the scientific community. I suggest that a committee, composed of members of the scientific and engineering professional societies, recommend approval of the candidates—in much the same way that a candidate for the Supreme Court receives the blessing of the American Bar Association. This will guarantee that the President's nominee will have the respect and confidence of his or her scientific peers.

We should also form a Cabinet-level science and technology department, to coordinate research and development activities among the non-defense federal agencies. The mandate of the Secretary of Science Technology would include the management and representation of these federally sponsored R&D programs. The Science Advisor would be responsible for advising the President on all scientific and technical matters, including commercially sponsored R&D and international scientific collaboration. In addition, the Science Advisor should provide an independent oversight function, with the resources to review the progress of technical programs, and to investigate when difficulties arise.

For example, the success of our national economic forecasting and planning depends critically on understanding the impact of technology trends on the economy; and yet there are no members of the Federal Reserve Board or the President's Council of Economic Advisors who have the professional understanding of science and technology which would provide that expertise. It seems clear that our abysmal financial forecasting could well in part be due to the total lack of understanding of one of the most important components of our society—technology. One of the functions of the Science Advisor would be to serve on these and similar Boards, Commissions and Advisory panels.

I hope that these hearings will provide a forum from which we can learn how to raise the technical consciousness of this and future Administrations. Our survival as a great nation depends upon our ability to understand the importance of science and technology and to incorporate its teachings into all aspects of our lives.

Mr. **Walgren**. Mr. Lujan?

Mr. **Lujan**. Thank you very much, Mr. Chairman, just a couple of comments.

I think this is an excellent way to have oversight of OSTP with Dr. Graham and, of course, the four other previous directors, the head of the agencies, that affect science policy. These are the people who have directed our science policy over—over the years.

I was thinking about a Task Force on Science Policy that Don Fuqua put—put together sometime ago. And I guess if—if anything came out of the whole—and the entire thing was—someone made the statement if it ain't broke, don't fix it, which meant that it was a—we had a very good science policy in this—in this country—pointed out that we should have an energy policy, a space policy, education policy, all of those, but then some way to tie it all—all together, and I think that's what we look for from OSTP.

So, Mr. Chairman, thank you very much for—for calling this—this hearing, and I look forward to the testimony of these different directors that are here.

Mr. **Walgren**. Thank you, Mr. Lujan.

Mr. Henry.

Mr. **Henry**. Thank you, Mr. Chairman. Just a brief observation before we proceed, and I think it's very proper we're holding this hearing and I commend your initiative in this area.

I think I should point out that the whole issue of how you institutionalize coordinated focus and attention no science has not been just a recent dilemma for the Congress or the Executive.

In your opening remarks you pointed out that the legislation to establish OSTP developed following President Nixon's decision to eliminate the science advisory apparatus which hitherto had filled that role, and pointed out that in the Ford administration there was vigorous support for the establishment of the office.

We had also pointed out, however, very quickly thereafter that President Carter, himself a scientist, abolished the President's Committee on Science and Technology, which was part of the apparatus. And then, of course, President Reagan, subsequent to that, abolished the Intergovernmental Science, Engineering, and Technology Advisory Panel.

So, obviously, the problems of how you formally institutionalize link and deal with these problems are not related to one administration, or one period of time, or one set of issues, some of which are always contentious, that are somehow inherent in term of what I take are ongoing concerns as to how to administratively best effect what we all seek.

Thank you, Mr. Chairman.

Mr. **Walgren**. Thank you, Mr. Henry.

Well, we want to express our appreciation to all the witnesses this morning and thank you for being a resource to the committee.

The leadoff witness is Dr. William Graham, the current Director of OSTP. And, Dr. Graham, if you would come forward.

After Dr. Graham, our next panel will be a number of former Science Advisers from several previous administrations and then we will have several heads of the principal R&D funding agencies of the Federal Government, and finally, representatives from industry and university who have been closely involved with these issues surrounding science to the President—and we look forward to all that testimony.

Well, welcome to the committee, Dr. Graham. And for all the witnesses, as you know, your written statements will be reproduced in the record within. More—and you should feel free to focus on particular point that you would like to underscore and emphasize, and we'd be happy to hear your thoughts.

STATEMENT OF DR. WILLIAM R. GRAHAM, DIRECTOR, OFFICE OF SCIENCE AND TECHNOLOGY POLICY

Dr. **Graham**. Thank you very much, Mr. Chairman, members of the subcommittee. Before I describe some of the mechanics and accomplishments and aspirations of OSTP, let me say a personal word of biography—on to OSTP from the National Aeronautics and Space Agency, having served about a year there as the Deputy Administrator, and part of that time the Acting Administrator.

Before that I served for three years as the Chairman of the President's General Advisory Committee on Arms Control and Disarmament—statutory committee reports to him in that area. During that time and for the decade or so before that, I was founder and senior executive of a company in California, which was very active in the high tech area. During that time it went from approximately 30 people to somewhat over 400 on its staff. For much of the time, I was the manager of the largest division of that company. Before that I was on the staff of the Rand Corporation. And before that a lieutenant in the Air Force.

Mr. Chairman, the Office of Science and Technology Policy was established in 1976 by Public Law 94-282. OSTP is one of the 11 agencies that make up the Executive Office of the President. It is headed by Director, myself, who is nominated by the President and confirmed by the Senate at the rank of Executive Level II. The Director then serves at the pleasure of the President. Both by custom and by specific designation, the Director of OSTP has also served as a Science Adviser to the President.

The statute makes provision for up to four Associate Directors of OSTP to be nominated by the President and confirmed by the Senate at a level no higher than Executive Level III. At present, Dr. Thomas Rona serves in one of those Associate Director positions.

OSTP has four Assistant Directors and a total full-time staff of 31, including four Fellows from professional organizations serving 1-year terms with the office. Twelve members of the staff are detailees to OSTP from other agencies of the government. Compensation for the members of the staff—for these members, the detailees—is provided in equal part by OSTP and by their agencies of origin.

The size of the staff of OSTP is in keeping with the role of the office as a focus of leadership and coordination among the governmental agencies. Technical research or development is not conducted within OSTP, nor should it be. But it is essential that OSTP be in close communication with those agencies of the government and elsewhere that are performing technical work relevant to the issues at hand.

While such communication is facilitated by a small staff, the creation of a large bureaucracy in OSTP would inevitably turn its focus inward and would predispose the office toward isolation from the larger governmental and non-governmental communities with which it must associate to be effective.

I think that's a very important point, Mr. President—Mr. Chairman—that the office in fact must work in close association with other agencies, must know what they're working on, what they're doing, must draw on them for coordination activities; and, therefore, it is in fact an advantage to the office, in my view, to be small and to be flexible to deal with the issues at hand.

According to established legislation:

> The primary function of the Director is to provide, within the Executive Office of the President, advice on the scientific, engineering, and technological aspects of issues that require attention at the highest levels of government.

To carry out its mission, such heavy emphasis on interagency—with such heavy emphasis on interagency coordination, the statute provides for several bodies, beginning with the Federal Coordinating Council on Science, Engineering, and Technology, whose members are the senior science and engineering executives of each agency of the government that has a substantial technical involvement.

FCCSET, as it's called, is chaired by me as the Director of the Office of Science and Technology Policy. It, in turn, has a number of committees reporting to it, including the recently established Committee on Earth Sciences, chaired by Dr. Dallas Peck, Director of the U.S. Geological Survey; the Committee on Life Sciences, chaired by Dr. Beverly Berger, Assistant Director of OSTP for Life Sciences; and previously established committees, including the Biotechnology Sciences Coordinating Committee, chaired by Dr. James Wyngaarden, Director of the National Institutes of Health; and the Committee on Materials, chaired by Mr. William Owczarski.

OSTP has extensive communications with those outside the government as well. There are 57 consultants currently associated with OSTP. First among these consultants are the members of the White House Science Council, which today is comprised of members: Dr. Solomon J. Buchsbaum, Executive Vice President of AT&T for Customer Systems, who is Chairman of the White House Science Council; Dr. Edward A. Frieman, Director, Scripps Institute of Oceanography, Vice Chairman; Dr. Harold M. Agnew, former President of GA Technologies and former Director of the Los Alamos National Laboratory; Dr. Allan—D. Allan Bromley, Henry Ford, professor, Physics Department, Yale University, the major participant in international science and technology cooperation, having led several government delegations during this administration; Dr. Edward E. David, Jr., Science Adviser to President Nixon, now with EED, Inc.; Dr. John M. Deutch, provost, Massachusetts Institute of Technology; Dr. Donald S. Fredrickson, former chief executive, Howard Hughes Medical Institute and former Director, National Institutes of Health; Dr. Ralph E. Gomory, senior vice president for Science and Technology, IBM Corp.; Mr. David Packard, Chairman of the Board, Hewlett-Packard Co.; Dr. Isadore M. Singer, Mathematics Department and professor of mathematics, Massachusetts Institute of Technology; and Dr. Edward Teller, one of the founders of the Lawrence Livermore Laboratory, also director of that laboratory, and a senior fellow at the Hoover Institution.

The White House Science Council, as senior scientific advisers, fulfills much the same function that other organizations, including the President's Science Advisory Committee, performed in previous years. Like the PSAC, they are purely advisory and carry no line responsibility or mandating authority. The White House Science Council reports formally to me as Director of the Office of Science and Technology Policy and, from time to time, meets with the President as well.

There is perhaps one significant difference between the White House Science Council and the PSAC. During its existence, the PSAC was chaired by the Science Adviser to the President, whereas the White House Science Council is chaired by a member of the Council itself and not by a member of the administration. This nongovernmental chairmanship gives the White House Science Council a somewhat higher degree of independence than an organization chaired by a member of the administration.

Various committees have been formed under the auspices of the White House Science Council to address specific issues. For example, in 1985 a White House Science Council committee, co-chaired by David Packard and Allan Bromley, prepared a report of the Panel on the Health of U.S. Colleges and Universities, where all such groups and panels draw on membership and support beyond the Science Council and the Science Council acts as the nucleus of these panels.

The effect of this report on the program of the National Science Foundation and other programs in the Government has been substantial.

Most recently, a committee has been formed under the auspices of the White House Science Council to provide an overall review and suggestions for guidance for the Federal efforts associated with the new high-temperature superconductors. This group is chaired by Dr. Ralph Gomory of IBM and has as its members Prof. Kent Bowen, MIT; Mr. Kenneth Oshman, a venture capitalist; Prof. Theodore Geballe, Stanford; Dr. John Foster, TRW; and Dr. Robert Schrieffer, University of California at Santa Barbara—and as it happens, the "S" in the BCS theory of superconductivity.

A close working relationship between OSTP and the other offices of the Executive Office of the President is essential. This working relationship between OSTP and the Office of Management and Budget, the National Security Adviser and his staff, the Council of Economic Advisers, and the White House office—which includes many of the staff functions for the President—are today excellent.

OSTP is an active participant in all interagency working groups that have a substantial technical component in their deliberations. These working groups generally support one or more of three Cabinet level councils that the President has established for developing policy recommendations: the National Security Council, the Economic Policy Council, and the Domestic Policy Council.

The Director of OSTP participates in deliberations of these councils whenever technical issues are involved or addressed. Of course, final decisions are made by the President after reviewing the recommendations of his policymaking councils.

In my experience, this system works extremely well, in that it seeks and discusses a wide range of options, and has a wide range of involvement, including, in my view, complete and total involvement of OSTP while forming a consensus wherever it is possible, and highlighting issues and then raising them to a higher level for resolution—consensus if possible.

While each President should have the latitude to organize the Executive Office of the President in a manner that best suits his requirements, I would strongly recommend that any future Chief Executive seriously consider the current organization as one that makes full use of the talent, capabilities, and diverse views that are assembled within the leadership of the government.

In the area of the U.S. economy and Federal budget, the Science Adviser has two major forums—responsibilities. In recognition of the fact that much of our economic strength, as well as our national security, depends upon our industrial development and application of advanced technology, the Science Adviser should take a strong interest in the health and well-being of our advanced technology enterprises. Minimizing unnecessary government involvement in private enterprise, encouraging and facilitating technical transfer from the government and university research to private industry, and acting as a catalyst to strengthen the interaction between government, university, and the private sectors—all fall into this category.

In the area of budget guidance and review, OSTP interacts with the agencies of the government during the budget formation process, and then works in partnership with its fellow agency—the Office of Management and Budget—when the overall Federal budget is prepared for review by the President.

In our current policy, research on the one hand and development on the other hand are substantially different. While both involve advanced technologies, development is oriented toward specific mission-related applications, while research—and particularly basic research—is directed toward our fundamental understanding of the properties of nature and the exploration of the ways that those properties can enable us to address new and different applications.

Throughout President Reagan's tenure, the Federal budget for basic research has grown at an annual rate of approximately $600 million per year, from $5 billion in fiscal year 1981 to an estimated $9.7 billion in fiscal 1988.

Mr. Chairman, I believe it's a tribute to the President and to the Congress for this strong and growing support that basic research has received. An equal tribute for the American people and their foresightedness and their wisdom in supporting basic research are seeds for our future development—our future society.

I believe that there are ample sources of funding to continue not only this large size for basic research but the growth of our basic research budget. The greatest threat to the Federal support of basic research is the temptation that will always be with us to divert those funds into product-oriented applied research and development activities. Such activities, which frequently require large amounts of funds, are better evaluated and more productively carried out in the private sector.

Our job in government is to see that the basic research, carried out largely by our universities and to some extent by our national laboratories, is made available to our producers—industrial, agricultural, service and others—in a timely and efficient manner, and in those areas where government must pursue applied research and product development because it is the only customer for those products—and we should certainly try to take full advantage of that and transfer technologies developed there through the private sector and to our private sector as rapidly as possible.

Mr. Chairman, the last year and a half have been active ones for OSTP. From initiating and helping to lead the overall review of national space policy that has recently been completed, to proposing and pursuing a new framework for international cooperation in science and technology that I tabled at the OECD science ministerial meeting October of last year, to leading presidential level negotiations in science and technology, such as OSTP and I are now doing with renewal of the United States-Japanese science and technology agreement, to initiating the Federal conference on the commercial applications of high-temperature superconductivity held last July, to addressing science and technology education issues for our work force, which have involved our deep involvement in women, minorities, and handicapped in science and technology—recognizing the serious problem we have—pipeline for our scientists and technologists of the future; those individuals now in the schools at the primary and secondary level that we must have if we are going to have the undergraduates and graduates and engineers and scientists tomorrow; to the establishment of the Thomas Edison Medal—technological innovation—presidential awards for excellence in science and math teaching for prime high school teachers.

But a less visible but equally important task of coordinating interagency activities in science and technology; helping to guide and review the Federal budget in these areas; providing a source of early detection and exploration of scientific issues for the President—OSTP, in consultation with many people, both inside and outside the government has, I believe, served the President well.

Thank you, Mr. Chairman, and I'll be pleased to address any questions you may have.

[The prepared statement of Dr. Graham follows:]

TESTIMONY OF WILLIAM R. GRAHAM, DIRECTOR OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY

Mr. Chairman and members of the Subcommittee on Science and Technology. The Office of Science and Technology Policy was established in 1976 by Public Law 94-282. OSTP is one of the eleven agencies that make up the Executive Office of the President. It is headed by a Director who is nominated by the President and confirmed by the Senate at the rank of Executive Level II. The Director then serves at the pleasure of the President. By both custom and by specific designation, the Director of OSTP has also served as the Science Adviser to the President.

The statute makes provision for up to four Associate Directors of OSTP to be nominated by the President and confirmed by the Senate, at a level no higher than Executive Level III. At present, Dr. Thomas Rona serves in one of these Associate Director positions.

OSTP has four Assistant Directors and a total full-time staff of 31, including four Fellows from professional organizations serving one-year terms with the office. Twelve members of the staff are detailees to OSTP from other agencies of the government. Compensation for these members of the staff is provided in equal part by OSTP and by their agencies of origin.

The size of the staff of OSTP is in keeping with the role of the office as a focus of leadership and coordination among the governmental agencies. Technical research or development is not conducted within OSTP, nor should it be. But it is essential that OSTP be in close communication with those agencies of the government and elsewhere that are performing technical work relevant to the issues at hand. While such close communication is facilitated by a small staff, the creation of a large bureaucracy would inevitably turn its focus inward and would predispose the office toward isolation from the larger governmental and non-governmental communities with which it must associate to be effective.

According to the established legislation: "The primary function of the Director is to provide, within the Executive Office of the President, advice on the scientific, engineering, the technological aspects of issues that require attention at the highest levels of government."

To carry out its mission, with such heavy emphasis on interagency coordination, this statute provides for the Federal Coordinating Council on Science, Engineering, and Technology (FCCSET) whose members are the senior science and engineering executives of each agency of the government that has a substantial technical involvement. The FCCSET is chaired by the Director of the Office of Science and Technology Policy. The FCCSET in turn has a number of committees reporting to it, including the recently established Committee on Earth Sciences, chaired by Dr. Dallas Peck, Director of the U.S. Geological Survey; the Committee on Life Sciences, chaired by Dr. Beverly Berger, Assistant Director of OSTP for Life Sciences; and previously established committees including the Biotechnology Sciences Coordinating Committee, chaired by Dr. James Wyngaarden, Director of the National Institutes of Health; and the Committee on Materials, chaired by William Owczarski.

OSTP also has extensive communications with those outside the government. There are 57 consultants currently associated with OSTP. First among these consultants are the members of the White House Science Council, which today comprises Dr. Solomon J. Buchsbaum, Executive Vice President of AT&T for Government Affairs, Chairman; Dr. Edward A. Frieman, Director, Scripps Institution of Oceanography, Vice Chairman; Dr. Harold M. Agnew, GA Technologies, Inc.; Dr. D. Allan Bromley, Henry Ford Professor, Physics Department, Yale University; Dr. Edward E. David, Jr., EED, Inc.; Dr. John M. Deutch, Office of the Provost, Massachusetts Institute of Technology; Dr. Donald S. Frederickson, former Chief Executive Officer, Howard Hughes Medical Institute; Dr. Ralph E. Gomory, Senior Vice President for Science and Technology, IBM Corporation; Mr. David Packard, Chairman of the Board, Hewlett-Packard Company; Dr. Isadore M. Singer, Mathematics Department, Massachusetts Institute of Technology; and Dr. Edward Teller, Lawrence Livermore Laboratory Founder, University of California.

The White House Science Council, as senior scientific advisers, fulfill the same function as other organizations, including the President's Scientific Advisory Committee (PSAC), performed in previous years. Like the PSAC, they are purely advisory and carry no line responsibility or mandating authority. The White House Science Council reports formally to me as Director of the Office of Science and Technology Policy. From time to time, they meet with the President as well.

There is perhaps one significant difference between the White House Science Council and the PSAC. During its existence, the PSAC was chaired by the Science Adviser to the President, whereas the White House Science Council is chaired by a member of the council itself and not by a member of the Administration. This nongovernmental chairmanship gives the White House Science Council a somewhat higher degree of independence than an organization chaired by a member of the Administration.

Various committees have been formed under the auspices of the White House Science Council to address specific issues. For example, in 1985 a White House Science Council committee, cochaired by David Packard and Allan Bromley, prepared a report of the *Panel on the Health of U.S. Colleges and Universities.* These committees draw on the membership of the White House Science Council and also on other expertise for their membership and deliberations. Most recently, a committee has been formed under the auspices of the White House Science council to provide an overall review and counsel for the federal efforts associated with the new high-temperature superconductors. This group is chaired by Dr. Ralph Gomory of IBM, and has as its members Professor Kent Bowen, MIT; Mr. Kenneth Oshman, venture capitalist; Professor Theodore Geballe, Stanford; Dr. John Foster, TRW; and Dr. Robert Schrieffer, University of California at Santa Barbara.

A close working relationship between OSTP and the other offices of the Executive Office of the President is essential. The working relationship between OSTP and the Office of Management and Budget, the National Security Adviser and his staff, the Council of Economic Advisers, and the White House office (which includes many of the staff functions for the President) are today excellent. OSTP is an active participant in all interagency working groups that have a substantial technical component to their deliberations. These working groups generally support one of the three cabinet level councils that the President has established for developing policy recommendations: the National Security Council, the Economic Policy Council, and the Domestic Policy Council. The Director of OSTP participates in the deliberations of these councils whenever technical issues are addressed. Of course, final decisions are made by the President after reviewing the recommendations of his policymaking councils. In my experience, this system works extremely well, in that it seeks and discusses a wide range of options, and while forming consensus where that is possible, highlights issues and then raises them to a higher level for resolution.

While each President should have the latitude to organize the Executive Office of the President in a manner that best suits his requirements, I would strongly recommend that any future chief executive seriously consider the current organization as one that makes full use of the talent, capabilities, and diverse views that are assembled within the leadership of the government.

In the area of the U.S. economy and federal budget, the Science Adviser has two major forums. In recognition of the fact that much of our economic strength, as well as our national security, depends upon our industrial development and application of advanced technology, the Science Adviser should take a strong interest in the health and the well-being of our advanced technology enterprises. Minimizing unnecessary government involvement in private enterprise, encouraging and facilitating technical transfer from government and university research to private industry, and acting as a catalyst to strength interaction betwen the government, the university, and the private sectors—all fall in this category.

In the area of budget guidance and review, OSTP interacts with the agencies of the government during the budget formation process, and then works in partnership with its fellow agency—the Office of Management and Budget—when the overall federal budget is prepared for review by the President.

In our current policy, research on the one hand and development on the other are substantially different. While both involve advanced technologies, development is oriented toward specific mission-related applications, while research—and particularly basic research—is directed toward our fundamental understanding of the properties of nature and exploration of the ways that those properties can enable us to address new and different applications.

Throughout President Reagan's tenure, the federal budget for basic research has grown at an average annual rate of approximately $600 million per year, from $5.0 billion in Fiscal Year 1981 to an estimated $9.7 billion in Fiscal Year 1988.

Mr. Chairman, I believe that there are ample sources of funding to continue not only the size but the growth of our basic research budget. The greatest threat to the federal support of basic research is the temptation to divert those funds into product-oriented applied research and development activities. Such activities, which frequently require a large amount of funds, are better evaluated and more productively carried out by the private sector. Our job in government is to see that the basic research, carried out largely by our universities and to some extent by our national laboratories, is made available to our producers—industrial, agricultural, service and others—in a timely and efficient manner.

Mr. Chairman, the last year and a half has been an active one for OSTP. From initiating and helping to lead the overall review of national space policy that has recently been completed, to proposing a new framework for international cooperation in science and technology, to initiating the federal conference on the commercial applications of high-temperature superconductivity, to the less visible but equally important tasks of coordinating interagency activities in science and technology, helping to guide and review the federal budget in these areas, and providing a source of early detection and exploration of scientific issues for the President, OSTP, in consultation with many people both inside and outside the government, as I believe served the President well.

Mr. **Walgren**. Thank you, Dr. Graham, we appreciate that testimony.

I'm sure that—that as you look back on your service in this position 5 years down the road, or however many years down the road, there will be both real accomplishments that you'll feel very proud of and, I'm sure also, inasmuch as we only can succeed partially in this world, real regrets that the office was not able to accomplish certain things under your—your time period.

My question is: What will be your greatest regrets?

Dr. **Graham**. Well, Mr. Chairman, I hope I don't have any great regrets at the end of this period. But I will say there are still substantial challenges before us—particularly establishing the clear legacy of the policy that the President has led in research over the last 7 years is very important—that Federal support for basic research remains and growing, and at the same time provide productive and timely interfaces for that research and other Federal scientific activities through the private sector; that we not impede the private sector in its pursuit of advanced technology. I believe those are moving very well.

One area that I think is a substantial challenge for this year and beyond has to do with international science and technology. In our history, international cooperation in science and technology has historically been somewhat at the scientist-to-scientist level—and that's appropriate and much of it should remain there. But its programs—some cases become larger or costly, or unique in the sense that they are likely to be one of a kind programs—one of a kind facilities like the Superconducting Super Collider—I believe the international role in—becomes more and more important to the conduct of the basic research. I think the issue's even stronger when you get to the economic and industrial issues of advanced technology and the relationship among countries in cooperation of industrial technologies.

Mr. **Walgren**. How——

Dr. **Graham**. If I might just make one last comment.

In terms of the trade relations, over time the focus of our international trade has moved into agencies which have a very high degree of training and competence in international trade—like the U.S. Trade Representative, and legislation's specifically been written to that point.

Science and technology doesn't have such specific identification today in its international relationship. While I would certainly encourage those trained in diplomacy to also train themselves in science and technology, I think the time may come as an evolving process that we are in today when those involved in science and technology and the government will have to take an increasing role in our international diplomatic relationship.

Mr. **Walgren**. One of the things that we hear talk about is the prospect that some of the larger individual science projects, the big science, may squeeze out the diversity and the breadth of support for the—for the individual researcher and for other kinds of science efforts.

You said in your testimony and emphasized the role of the Science Adviser in providing technical advice to the policy advisers of the President, and really rather confined yourself to emphasizing the role of the Science Adviser in meeting with those people to technical advice.

Particularly in view of the fact that—that the office was originally focused on long-term—long-term questions, that the—every 2 years—science and technology report, an outlook has never apparently been given any life, let alone published. And others have looked to that as a benchmark for looking down the road.

Are you comfortable that—well, that's not—probably not the way to ask it, but is there a danger that we are not looking at the long-term effect of these large science projects?

Dr. **Graham**. Taking your question slightly reversed in order, the biennial report is important. I have signed it out to you—reporting on the last 2 years of my predecessor's tenure required some time to do well, but we viewed it as a substantial report and took the time to do it carefully. It hasn't arrived in your office yet, but I can assure you it's on the way.

As far as the longer term issues—first by emphasizing our technical involvement, I don't mean to imply that we only help in the solution of the Schrodinger equation as it comes up in matters of government. There's no issue that rises to the Executive Office of the President that is purely a technical issue. Those can be handled at the other—other levels in the government. You are always dealing with issues which involve the intersection of science, technology, economics, of international relations or national security, diplomacy—that's what we're chartered to do. And that includes not only the short-term but the long-term.

The big programs are very important components of our overall science and technology; and, nevertheless, we have a great deal of interest in the individual researcher. And we have attempted, and I think successfully—structured the large programs, so that they're done as a part of this increasing budget in basic research, so that they specifically will not withdraw resources from the smaller research programs.

And we're sufficiently—and so dedicated to that concept that this year, in fiscal 1988—and it was a year in which we very much wanted to start science and technology centers under the auspices of the National Science Foundation—we found that in the final budget we didn't have sufficient funds to do that and to continue the individual and smaller research programs that we had supported previously. So, we've deferred the science and technology centers to 1989 for their initiation. There's no choice—but we've done it.

Mr. **Walgren**. But that certainly was not a choice between the big science and the small science.

Dr. **Graham**. Well, the science and technology centers are at least middle size science in that they involve the collective groups of interagency and interdisciplinary teams inside university, and they certainly aren't the individual grant science that we were expecting.

Mr. **Walgren**. Mr. Boehlert?

Mr. **Boehlert**. Dr. Graham, your testimony expresses sort of general satisfaction with the way things are sort of a maintenance of the status quo.

Do you have any specific changes you would recommend?

Dr. **Graham**. Well, as I mentioned, I believe the area of international science and technology cooperation, both in basic research—particularly focused toward the large programs, which are somewhat new, but also the historical relationships at the smaller scale—and increasingly the importance of our science and technology cooperation of other countries for——

Mr. **Boehlert**. That's his bell for his time.

Dr. **Graham**. Commercial and economic benefit for both countries will become more and more important. On the one hand you have issues of export control. On the other hand you have issues of international cooperation teaming and international cooperation tech flow in and out of the country, Federal budget investments, and research and development—I think those are going to become increasingly important. And I see us in an evolving process of increasing our technical sophistication in those areas—the involvement of a diversity of agencies and international relations in science and technology.

Mr. **Boehlert**. I agree with you, Dr. Graham, on international cooperation. But I'm not particularly happy with the way in which we're proceeding—and I use the SSC as a good example. That's going to be the most costly big science project, what, in the history of the country. And there was a conscious effort on the part of our good friends and neighbors to the north—the Canadians—to be part of the action—and they weren't even permitted to submit to DOE for consideration a proposal involving transboundary site.

Did you have any influence with DOE, or did they discuss that with you—the possibility of this international joint venture?

Dr. **Graham**. Yes, they discussed all aspects of the Superconducting Super Collider. And that was one of the issues raised, and it was decided that the complexities of the program—the size of it—was sufficiently great, that while we would encourage Canadian participation—actually constructing it across the boundary—the practical matter not feasible.

Mr. **Boehlert**. The DOE people told me—this was rather bizarre; I don't know if they told you the same thing—but they suggested to this committee in testimony last year, they didn't think a transboundary site would be fair.

And I said, fair?

And they said, well, it would give an unfair advantage to one site.

And I said, what about the advantage it might give to the American taxpayer?

That sort of intrigued me. We're talking about a $4½ to $6 billion project, and our good neighbors to the north—and the President and the Prime Minister having a love-in these days, free trade agreement and everything else—they want to participate financially, professionally, scientifically, and every way possible; and yet, we summarily say, no.

Dr. GRAHAM. We're not opposed in any way to them participating scientifically, financially, or in the divine operation of the facility. Just as we are—not only are we not opposed to it, but we strongly encourage it. And not only the Canadians but all of the countries that we have close technical and diplomatic relations with, including those of the European countries.

Well, I think the specific question that you are addressing was, were we going to try to build it in two countries—and decided that that was—add sufficient complexity to the problem that it was just not feasible. That's my evaluation of the situation, and I'll let DOE speak for themselves.

Mr. BOEHLERT. They really don't speak for themselves very well—that's why I thought I'd take advantage of this opportunity to ask you this question. [Laughter.]

Dr. GRAHAM. Pleased to answer.

Mr. BOEHLERT. You say on page 4 that the Science Adviser should take a strong interest in the health and well-being of our advance technology enterprises.

If you were to give a medical report on the health of our advance technology enterprises, what would you say?

Dr. GRAHAM. I would—first I would start with a historical diagnosis. I would say that at the end of World War II, the industrial strength of the United States was completely intact and running wide open; whereas, many other countries were—had been destroyed by the—by the war. Those countries saw the United States as a—as a goal that they were trying to—trying to equal. So for four decades they—many of these countries have worked to make progress rapidly enough to catch up with the United States. That meant necessarily they were making technological progress more rapidly than the United States was. If they didn't, they would never catch us in anything.

And, while none of them have done it in anything approaching across the board, some of them have done it in specific areas and have essentially equalled us in particular technical fields and are now accustomed to a higher rate of technical progress than many of our industries are.

So I think the—the prediction for the future health of our industry is that our industries must realize that technological advancement and progress is more important in the next decade and beyond than it has been in the last four; and, they are going to have to—have to realize, and in some cases wake up to the fact, that they are going to have to be more technically innovative, more willing to—to look not just at the 2- and 3-year horizon, but at the 5- and 10-year horizon to compete with these countries which are making very rapid technological progress.

I think our industry's well up to it. Our form of government and the diversity of our society is—is exactly what's needed to deal with rapid technological progress, and our industry just has to do it—and I think it can.

Mr. **Boehlert**. On page 4 again, you talked about during the President's tenure, about the Federal budget for basic research growing at an average annual rate of approximately $600 million per year. I'm certainly a strong advocate of growth in the Federal budget for basic research .

How about the growth rate in defense research versus non-defense research?

There are a number of us—we strongly believe in a strong national defense—that are concerned that a disproportionate share of our research dollars are going into defense-related activities exclusively.

Dr. **Graham**. Let me divide that issue into—into two categories.

First, there's the basic research that underlies both our civil economy and our national security—usually described as the 6.1 and sometimes the 6.1 and the 6.2 moneys in—in the Defense program.

Then there are the specific developmental activities designed to produce products for military use—airplanes, ships, tanks, and so on.

In the area of the—of the basic research, the underlying research that supports our national security, the 6.1, or the 6.1 and the 6.2 moneys, I'm concerned, but for a different reason—I'm concerned that the growth that we've put into those funds in the specifically national security area—that is funds supported by the Department of Defense—have essentially been constant, have not grown at all.

And I believe that we should give more emphasis to the support of basic research within the Defense Department as elsewhere in the government. And I think that is a potential deficit in our Defense program which we'll only have to pay in future years—when we pay more for military hardware and systems than we might otherwise because we didn't do enough of a fundamental work at this time when we could have.

The developmental activities are not properly, in my view, part of the research program. Research and development are somewhat strange bedfellows because the developmental activities, while large, are specific, product-oriented; and those tend to scale with the number of military systems that you are developing—and that has increased in this decade and, of course, the developmental costs have gone along with that—and appropriately so.

Mr. **Boehlert**. Just one last one because my colleagues want an opportunity to question you.

Looking ahead—photonics research. Can you give me your overview as the Science Adviser to the President and the potential the area of photonics?

Dr. **Graham**. I certainly can. In fact, I'm having a meeting with one of my colleagues in the Executive Office of the President today who is very interested in advance technology to show him some hardware and describe photonics to him. It was done at his request, in fact.

I think it has enormous potential in information sciences. Of course, it's already being used extensively in telecommunications with fiberoptic transmission, amplification, and so on. Optical data processing in some ways is—as an analog field is already practiced. Optical data processing as a digital discipline using non-linear devices is just at its starting point today. But I think we'll find for a variety of reasons—the fact that the signals travel at speeds comparable to the speed of light—that cross-talk among members, among transmission paths, and so on, is small, that things can be miniaturized to a high degree, and so on. We'll prove that photonics will have many applications in data processing and information processing, as well as in telecommunications and data transmission.

Work is going on in that under IR&D and the Federal contractors, and to some extent in the government laboratories. But a great deal more is going on in the private sector in that area.

Mr. **Boehlert**. I just want to, after this hearing, have a chance to talk with you because we've got an exciting joint venture under way—and it happens to be in my congressional district so I have a little more interest in it—between the Air Force and the universities; the State of New York is coming on board, and it offers some great potential for the future, and I'd like the chance to discuss it with you following this hearing.

Dr. **Graham**. I look forward to that, Mr. Boehlert. And I agree with your assessment of the importance of that area.

Mr. **Valentine** [presiding]. Mr. Brown.

Mr. **Brown**. Thank you, Mr. Chairman.

Mr. Graham, I agree with you and the emphasis which your office and the President have placed on the support of basic research. I think we're all pleased that the—the degree of growth that we've seen in the support for basic research.

Having said that, I have to take issue with the way you categorize the—the tension here in the terms of your statement—that you felt that the most serious threat was the diversion of basic resource—basic research funding to product-oriented applied research and development.

I think that is a fallacious dichotomy, if I may so, and I'm disturbed by what I perceive as a rather consistent philosophical policy orientation toward making that distinction and neglecting that very important interstice between those two areas.

Let me quote to you briefly from a recent report—report from the National Research Council.

It's entitled "Space Technology to Meet Future Needs," but it could just as well have been entitled "Technology to Meet Future Needs." And it says: "Over the past 15 years, the NASA program for space technology has been severely restricted and mainly focused on relatively modest advances in state-of-the-art support of near-term NASA missions. It is no overstatement to say that NASA's preoccupation with short-term goals has left the agency with a technology base inadequate to support advanced space missions."

That statement's also true about a good deal of the technology base of the entire country.

It goes on to state that our national launch vehicle program is inadequate basically because of lack of research and new propulsion systems. It says, new materials research is inadequate. It says that life support system technology has been dormant for 20 years. It says that advances in robotics has been neglected.

It says we have failed to keep up with the advances in information systems necessary to meet the name—the mean—the needs of advanced space mission.

Now, these are all equally applicable to our total national technology base: robotics, information systems, new energy conversion systems. This report came out last year.

I will say that I have been pleased to see the new space policy of the President because it recognizes some of these things and proposes to move us back toward a program of support for the—for these kinds of what we call technology base of development.

Unfortunately, the level of such support is minuscule compared to what is recommended by the National Research Council.

Now, I don't necessarily feel that the National Research Council is gifted with all wisdom, but the contributors to this report represented a cross section of the best scientific and technological knowledge of this country—and they came to this conclusion unanimously.

Now, do you feel that possibly there is any validity to these kinds of statements and that we are neglecting that area between basic research—which I agree that we're supporting adequately—and what you call product-oriented applied R&D which leads to commercial products?

None of these things in them—none of these areas that I have mentioned, quoting from the report, are aimed at specific commercial products. They are aimed at developing a technological base from which private enterprise may be able to develop a host of—of commercial products, but they are not themselves directed at commercial products.

Could you comment as to whether or not you feel that there is in fact such a gap and that the President's recently announced new space program is aimed at beginning to fill that gap?

Dr. **GRAHAM**. Well, there's an overall policy issue and one specific issue on the space program. I'll see if I can address both of them in some consistent way because they are in fact part of the same general approach.

I can assure you that the interface issue—the transition between basic research on the one hand and economic strength and national security on the other is a major concern and a major policy area that we deal with in government. It is not in any sense being neglected. In fact, a number of steps, including the Technical Transfer Act of 1986, the President's Executive Order 12591, and other initiatives such as you mentioned—the Pathfinder Program that NASA's undertaking, the engineering research centers, the hoped for science and technology centers, the superconductivity research centers that we've established at a number of government laboratories, and, more generally, the process of taking the technologies that we must develop in the government's necessary product development and making those available to U.S. industry as rapidly as possible is constantly before us and on our minds—a very high priority issue.

We believe that the principal barriers here overall are in taking the—the large $50 million—$50 billion bulk of the developmental work that the government does necessarily every year and mining the full benefit out of that for our commercial endeavors. That is the greatest challenge before us.

Second, making sure that there are well defined, functioning, and productive interfaces go all the way from the basic research to the private sector on the one hand to those government development efforts to the private sector on the other hand.

I would say that that emphasis in those areas will provide us with a great—a great wealth of this transitional technology without agreed investment beyond what's already being expended by the government.

Then when we find specific areas that need further work—what I call research on the enabling technologies, as you accurately described, not product focused and not particularly company focused—generic to a line of industrial progress—it certainly is appropriate that government take an active interest in this, and government is doing that.

The Pathfinder program is a little bit of a mixed case. It's really focused toward the longer term—a longer term capabilities of a space program which at that end is a government-supported, large developmental effort, as well as a research effort. So Pathfinder is in support of what will later be government developmental efforts as well.

But we are also trying—and I think successfully—encouraging private investment, private initiative, to come into the space program. You see it in the program to have commercial expendable launch vehicles and in the program to encourage a number of steps between where we are today and the final $15 billion space station. So that we don't try to make one leap from Skylab to the space station; but rather, we have a number of steps: the shuttle, perhaps an extended duration shuttle, perhaps a man-tended space platform. Perhaps we'll find other steps in this process.

The more we can have commercial investment involved in those, in cooperation with the government, the better.

So while there're certainly issues in that area that will remain before us, I wanted to assure you that they are not being neglected by any means.

Mr. Brown. Well, I don't want to imply that there isn't progress being made. I think this committee commends some of the steps that you've described: the engineering research centers, the science and technology centers, the efforts at building partnerships with private industry to attack certain issues of manufacturing technology, and other things of that sort—they're vitally necessary.

But it seems to me, and it seems to many others as well that we are coming a little late to recognize the—recognizing the importance of some of these initiatives for our overall national economic health. This committee has been deeply disappointed, for example, at the lack of—of the failure of the administration to carry through with the, for example, the materials research program—a critical materials program, which has been—well, likely it has been a catastrophe. And it has been described as even worse.

There are other areas in which we have fallen behind: the lack of support for the advanced communications satellite program as a means of keeping our leadership and advanced information technologies; the need to establish a Sematech Corp. because we had failed to keep up with manufacturing technology in the chip—chip business.

It seems to me that we are beginning to recognize these failures, and it takes some feeble first steps to correct them. But the point I'm trying to make is, why did we allow these to develop over 15 years so that it has created a major imbalance in the world economy and destroyed leadership positions that we once had?

I recognize the validity of what you said about the other nations doing the catch-up thing. But they've gone far more than catching up in a number of these areas. They have eaten our lunch, to put it mildly—and unnecessarily so in the light of our failure to fund that particular area of base technology development that I'm talking about here.

That's hardly a question, is it? But you——[Laughter]

Mr. BROWN. You may comment briefly, and then we can let somebody else work on it.

Dr. GRAHAM. Oh, I—I believe in fact we have a generally good division in the activities between government and private industry, and it would be very counterproductive if we tried to introduce government into those activities which can reasonably be supported by industry, such as the advanced communication technology satellite. Communication satellites are a very profitable business—certainly will invest enough to support what it feels are the future requirements in that area.

Sematech—I applaud the semiconductor industry coming together forming joint R&D ventures. I would even like them—to see them be able to come together and form joint manufacturing ventures. And there's an area of legislation in dealing with potential antitrust conflicts where for the general purpose of encouraging competition we have established antitrust laws, which in this present day of international trade sometimes have the effect of putting us at such a disadvantage to international competitors who can join together different corporations and big vertical integrated conglomerates that we're at a disadvantage in competition under the constraints of a law which was designed to make sure we were very competitive—certainly areas we need to go back and revisit.

But I would argue against taking research funds or government support generally and putting it into those areas of technology where industry knows what its doing, has the incentives, and certainly has the wherewithal to carry out the work much, much better and much more efficiently than government can.

I think, even worse than that, if the—if our industries begin to believe that if they just get in enough trouble financially, then government's going to rush in and save them—that's hardly going to encourage them to be strong and viable and careful competitors, which is what we need in the long run. Taking our high technology industries and offering them the opportunities to become wards of the state is no way to compete in the international market in the future.

Mr. WALGREN [presiding]. Mr. Lujan.

Mr. LUJAN. Let me follow up on that a little bit.

Mr. BROWN. Yeah, let me—Lujan talk.

Mr. LUJAN. Dr. Graham, there is some justification—quite a bit of justification as Mr. Brown says, that we do very well in some areas. We do that very well in NASA with the aeronautics portion of it and that gets done rather rapidly. He mentioned the new approach of helping the private ELV launcher by allowing these government facilities for launching and then we have some legislation here that will help in other areas.

But it seems to me like it might not be a bad idea to have a policy that includes some kind of a civilian DARPA—that kind of thing; not necessarily taking it away from basic research—nobody wants to do that. But some mechanism that gives a little boost to the private—private sector for launching. I don't know what that is but that might be examined as one of the policy areas to take.

Having made that comment, I wanted to get into organization more than specifics. You're both the Science Adviser to the President and the head of OSTP. We're talking about the White House Science Council, which reports to you, and then the President's Scientific Advisory Committee that used to report directly to the President. I'm trying to establish that conflict as to that you have the sole access—whether that works better—sole access to the President here on scientific policy—science policy, or is it better to him, a couple of different sources?

Let me point a couple of things that—that we do and look at them in that light. On this committee, many of us are concerned about—with the dual sourcing of the rocket motors, what we do about that, of just one company doing it.

And the DOE laboratories, there's always a—if you wanted to try out some concept as we did with fusion, for example, we have Livermore try one approach, we have Los Alamos try another approach, and then see how it comes out.

In that light, which is better, that—that there's one after the President or maybe a couple others, as a policy.

Dr. **Graham**. Let me speak as the Director of OSTP, if I might, and not as the Science Adviser, which is a staff function to the President and appropriately left for his—his specific use.

The possibility of a civilian DARPA—several countries in the world use that approach to advance applied research and development activities—United Kingdom, for example; European countries—France. In talking with their science ministers and their science advisers, I find that their view is one of trying to figure out of that condition and into one more like ours: basically to leave the—the—what would otherwise be tax dollars in the pockets of industry and in the pockets of the individual entrepreneurs, and let them vote with their dollars in those things that need to be done, because they have a—they have the right incentive structure, they have the right to—the right insight into the investment, and they are vitally involved with the success of it, in the specific detailed way that it would be virtually impossible for government to undertake.

I think if a—if a history were produced of those large commercial areas that government got involved in and those large commercial areas that the private sector got involved in, we would find that the greatest effectiveness was where the government was a—was a thoughtful and constructive customer for advanced civil technology such as we proposed in the Space Launch Program or the man-tended Space Platform Program, or the supercomputer program, or the High-Speed Telecommunications Network Program, and not where government becomes the director or the controller of the—and the manager of the commercial research and development activities.

So I would like to—to suggest that while we may wish to—to go back and revisit this on a case-by-case basis, I think we will find that—that more countries are trying to move to our system than the other way, and for very good and productive reasons.

Mr. **Lujan**. If I may interrupt for just a moment.

Dr. **Graham**. Yes.

Mr. **Lujan**. The French wouldn't have Arianne if it weren't——

Dr. **Graham**. They wouldn't have the Arianne because it's developed by the government much as many of our boosters are developed for—for research or for military applications. At the same time, after they developed the booster they handed off to Arianne Space—a company which at least attempts to—to make a profit at that business. Whether they do or not is, in my view, a mystery of the European accounting systems and I won't presume to comment on that.

But certainly they're trying to sell their majority interest in several of their high-tech industries, like Thompson and like Matra—trying to essentially get out of the controlling role in those industries and put them more under private control, more in the private sector.

Mrs. Thatcher is doing exactly the same thing in the United Kingdom—trying to leave the—the applied research and development to the industries and not have it done in the government laboratories or under direct government subsidy.

I think that's important here. I think we should—we should—whatever else government does, it shouldn't get in the way of our industry prospering. Our industry should be able to work together on these research and development ventures. I believe in some cases, for production ventures as well—and sales ventures. And that would help us very strongly in the international competition.

But putting—but I would not extend that to putting government in a commanding role in the conduct of—of marketplace research. It's just not government's strong suit.

As far as the dual source issues are concerned—I believe that science advice, which is, of course, always addressed in the context of these—of these many other components—economics, international relations, national security, diplomacy, and so on—are addressed by a very multi—a great multiplicity of sources, starting with the diverse agencies of the government. When an issue comes forward that involves more than one of them, it immediately is addressed in an interagency group under the auspices generally of one of the three policy councils—and if we've done our job right in OSTP, will have been addresssed in its technical components before that under the Federal Coordinating Council on Science, Engineering, and Technology, to FCCSET, to weigh the technological base for the issue. And then——

Mr. **Walgren**. The gentleman's time is expired.

Dr. **Graham**. Okay, just two—30 seconds—carried forward to the policy councils and to the President and in each of these stages, until finally the option paper is put before the President with each position that an agency wishes to support, and the pros and cons reasonably stated, and he makes the final decision—you have a multiplicity of inputs: the Science Adviser in some roles and the Director of OSTP as one of those, but no means the only input in that process.

Mr. **Walgren**. The gentleman's time is expired.

Mr. Henry.

Mr. **Henry**. Thank you, Mr. Chairman.

On really the same issue, and just pointing out the awkward position we're put in—in Dr. Graham's statement, the greatest threat the Federal support of basic research is the temptation to divert those funds in a product-oriented applied research and development activities.

Now, Dr. Press is not with us, so I take it—and I don't know if someone's planning on reading his testimony—but at any rate, his statement is: boundaries between basic and applied research on being eroded, and in many fields the time between discovery and its commercialization is now measured in years rather than decades——

Dr. **Graham**. Yes.

Mr. **Henry**. As we all know. And that's the problem.

Then the problem is that if you honor this wall—and it's a wall which I would agree with you in theory; ought to be honored—for any number of reasons, among them for practical reasons. But it's this terrible frustration—the United States, although still at the forefront of science and technology, appears to be slipping behind in the development and diffusion of some technologies —and that's the rub.

So I guess I am saying I agree with you in theory, but give me an answer to making the three workable and one which addresses the problem of Dr. Press, who really kind of comes down pretty strongly. I don't know if you can just attribute it to antitrust laws, liability problems, something else in terms of diffusion; in terms of the vigor of adaptation and application within our own society is being lost.

Dr. **Graham**. I believe there are two components to that. One is that we in government have to work harder and be more imaginative than ever before to—to not have this be an impenetrable wall between these two areas; in fact, it's something of a transition between the areas—but to not make it difficult for information to flow across that.

I believe you—you've put your finger on it when you said in the past we had a long time for this diffusion to take place; but today, it has to take place very rapidly. And I think we need more invention in that area of providing the interfaces between the research and the development work done in government and in the private and commercial sector. We're certainly working at that, and that is one of the major roles of the engineering research centers—of which some 13 have been established to date. It was to be the role of the science and technology centers, which we still aspire to create; the role of the superconductivity centers, many other types of activities of this sort supported by the agencies and by the—the National Science Foundation.

Mr. **Henry**. May I just at this point interrupt. In other words, this is the role of the science and technology centers that are going to be postponed another year?

Dr. **Graham**. This was one of the roles——

Mr. **Henry**. I think we should be talking about the same thing here.

Dr. **Graham**. Yes, that's right. This was one of the——

Mr. **Henry**. Yeah.

Dr. **Graham**. The major roles——

Mr. **Henry**. I guess that's—that's my point.

Dr. **Graham**. Of science—well, it—that's, unfortunately, a—purely a budget issue and has to be traded off against——

Mr. **Henry**. It's not a budget issue—it's a priority issue.

Dr. **Graham**. Exactly. It's—that's what I was—would like to say. It has to be traded off against other activities. And we feel so strongly that the support of the grantees and the individual researchers in its importance is sufficiently great, and we have—and we're not neglecting the area of the interface. We're only trying to generate new ones at a rapid rate that we've decided to defer science and tech centers for a year—let the engineering research centers and other activities continue to mature.

But I agree with you; I'm not happy with that. I would prefer to do both of them, but I don't want to go out and cut the individual research or grants to make that happen.

The other half of the problem is the industrial interest. We can define and develop and establish all the interfaces in the world—which I think can reasonably well be characterized in terms of their processes—but if industry isn't interested, if we have in the future some of the problems we've had in the past where we have more visitors at national laboratories from foreign countries than we have from the U.S. industry, more interest in research going on in universities from foreign companies than we have from U.S. companies, then all the activities that the government undertakes to set up these interfaces won't work. Industry has got to want to get to this technology and to incorporate it in its own programs, and advance with it by—much more rapidly in the future than it has in the past.

And that was one of the—in fact, the major underlying motivation of the Federal Council on—of the Federal meeting—conference—on the commercial applications of—of high-temperature superconductivity last summer. We wanted the U.S. industry to know that there were many things going on in government, many opportunities there in government and in the private sector. But they had to take the initiative; and, they had better not wait until this becomes perfectly understood and perfectly characterized; or, they are going to be far behind foreign competition.

One of the roles of government is to act as a leader and a catalyst in various areas. The President has spoken on this matter. I speak on it constantly. Other agencies speak on it.

I think the message is getting across, but it's a process that takes some time and some industries just have to wake up—we're trying to wake them up.

Mr. **Henry**. Thank you, Mr. Chairman.

Mr. **Walgren**. Thank you, Mr. Henry.

Mr. Valentine.

Mr. VALENTINE. Dr. Graham, I want to ask you a question or two about what was referred to earlier as big science. And, of course, that leads us to the SSC.

It would be a correct assumption, would it not, that the—the OSTP advised or recommended to the President of the United States that he make the SSC—that he give it a high priority in his thinking about the future of science in the United States; is that correct?

Dr. GRAHAM. Mr. Valentine, it's—it's a hazardous climate for advisers to the President to recount their advice before or after given. But I would say that I'm a strong supporter of the SSC in that program.

Mr. VALENTINE. Well, I certainly don't want to—to ask you any question which would—might attempt you to say anything that you would regard as improper. I don't want to get into any personal conversation. But I would think it would be a fair assumption that you are the President's—you and your group are the President's science advisers—not political advisers, but science advisers—and that you had some input.

The reason for—for dwelling on that is—is because I want to ask you this question. Did you have any significant input, Dr. Graham, into the selection process that was developed by the Department of Energy?

Dr. GRAHAM. As the details of that process are concerned, those were prepared by the Department of Energy, along with other parts of the—of the administration. I reviewed the overall approach that they were taking to that selection process; kept track of the modifications in it that have been made by the Congress.

Mr. VALENTINE. The Department of Energy, I suppose, would be—be regarded as in the, at least to some extent, in the political arena, and OSTP in—in more elevated environment. And did you have confidence that the decisions which have been made with respect to the selection process—the criteria which had been developed and outlined—you have confidence, either personally or professionally, that the decision with respect to that initiative will be made without any undue "political" considerations?

Dr. GRAHAM. Yes, I do, Mr. Valentine.

Mr. VALENTINE. Do you believe, Dr. Graham, that the—the selection process as developed and promulgated by the Department of Energy under which the process is now functioning—the selection process—do you believe that that provides for a—a way for the Congress and the American people to have a full and complete disclosure when the site is finally selected to make a determination as to whether or not they did make the decision based on the criteria that they laid down, or whether pure, naked, political considerations entered into it?

Dr. GRAHAM. I believe that—that Congress has both the right and the obligation to explore all the processes that commit Federal funds. And certainly the processes that commits them to the SSC, including its design, its site, and its characteristic—I think we have to have confidence in the National Academy of Sciences, the National Research Council, that's done the initial review and the down-select of the sites for the SSC—and I know that there are many competent scientists and engineers in the Department of Energy who are pursuing that process further. So I have—I have no reason to question either their ability to carry out that job nor the ability of Congress to review it.

Mr. **Valentine**. Thank you, sir.

Mr. **Boehlert**. Mr. Chairman, may I jump in on this to follow up just for one brief moment?

Mr. **Walgren**. Yes.

Mr. **Boehlert**. You said, Dr. Graham, in the selection process, you reviewed the overall approach of the Department of Energy.

Did department officials discuss with you the possibility of a transboundary site? Did they seek your input?

Dr. **Graham**. That was mentioned in the general proceedings; yes, it was.

Mr. **Boehlert**. And would you share with us generally your feeling on the possibility of a transboundary site with our neighbors to the north, our friends, our allies?

Dr. **Graham**. Well, I'll—I'll give you my view on it, which is that on the one hand certainly protons will cross national boundaries without any change in state that we are aware of. [Laughter.]

It's not a scientific question in that sense. At the same time, building a facility of this size is a very—very large and difficult undertaking at best. And doing it between countries, even as close and as good a neighbors as the United States and Canada are, would certainly add substantial complication to an already very complex process.

Mr. **Boehlert**. That's what science is all about—making complex things simple.

Mr. **Walgren**. The gentleman from North Carolina controls the time.

Mr. **Valentine**. I don't—I'm—I don't have any further questions, Mr. Chairman, thank you. I yield back the balance of my time.

Mr. **Walgren**. The Chair thanks the gentleman.

The Chair recognizes Mr. Nagle.

Mr. **Nagle**. No questions.

Mr. **Walgren**. Miss Schneider?

Miss **Schneider**. Mr. Chairman, I think that my colleagues have done a stupendous job in touching all of the issues that I'd hoped to discuss with Dr. Graham—everything from the Superconductor Super Collider to the contrast in our funding for defense versus non-defense items in the research budget.

Dr. Graham, let me commend you on what I believe to be an outstanding job that you have been doing. Let me say that I'd like to summarize to some degree much of what has already been said here today, or give you the opportunity to summarize in the following way.

Each election year we Members of Congress are called upon to give some specifics—short, sweet, you know, 30-second nabs on the TV set: What have you accomplished? Why do you deserve to be reelected, or whatever?

Of course, when we meet our maker, we're going to have to itemize those goodies that we have accomplished on earth too.

I'd like to give you the opportunity to list very quickly for us what are those areas that we can look to OSTP for having made tangible accomplishments? Maybe three or five top items.

Dr. **GRAHAM**. Thank you for the opportunity.

Certainly the—the overall review of our national aeronautics program and the—and the future potential for progress in aeronautics—something we're strong in as a Nation already, both in vertical and—all the way from vertical takeoff and short takeoff aircraft to hypersonic aircraft at the other end, is something that OSTP has sponsored; and I believe has led both to a strong sense of purpose in the aeronautics industry and strong support of the government in the basic research up through the enabling technologies in aeronautics.

Miss **SCHNEIDER**. Okay.

Dr. **GRAHAM**. The "Bird" books ["National Aeronatical R&D Goals"] are—are the publications of that, and work that went into those has been substantial.

In the area of space policy, OSTP initiated the national space policy review that began last summer and was released last week, and was a very active participant in that. I think the product—an interagency product—of space policy will serve the Nation well for many years to come.

OSTP also took a major role in the National Commission on Space—and, in fact, that Commission reported to OSTP. That Commission, chaired by Tom Paine, provided a major input to the overall space policy effort that the government undertook.

In the education and science and technology area—I think the effort we've made in helping to identify the concerns in that area, the concerns, if not the empty pipeline coming up from the primary and second schools, that the almost empty pipeline of people with the background and interest, but most of all the motivation to go through the rigors of training in science and technology——

Miss **SCHNEIDER**. Dr. Graham, let me interrupt——

Dr. **GRAHAM**. Are very important——

Miss **SCHNEIDER**. For just a moment.

Dr. **GRAHAM**. Yes.

Miss **SCHNEIDER**. It seems that about 3 years or so ago, industry itself was very much involved and educators in bringing this resource gap of—human resource technological gap to the forefront—about 3 years ago, through the business higher education forum; a group with which I have been closely aligned.

So they've been talking about it for a long time. But I am interested in your just quickly listing some actions which essentially will change the course of science policy, the course of history, or whatever. If there are just two, that's fine—or three, or whatever.

But what kind of tangible specifics have—has OSTP personally been responsible for?

Dr. **GRAHAM**. Well, certainly—the OSTP role is one of—of coordination and leadership. So virtually anything you find us involved in, you'll find other agencies involved in as well. But we were the initiators of the—under the President's general guidance to conduct the overall review of national space policy——

Miss **SCHNEIDER**. Okay.

Dr. **Graham**. And that has produced a tangible document on national policy.

Miss **Schneider**. Great.

Dr. **Graham**. I think it contains many new elements.

Last October, when I led the U.S. delegation to the Organization of Economic Cooperation and Development Science Ministerial meeting, I proposed a framework for international cooperation in science and technology that defined both the obligations and the roles of nations in the international—in the area of international cooperation in science and technology. And that framework was well received—received with some surprise, I might add, too, because the science ministerials had been going on a long time without such a—such a framework in place, but generally well received, after the initial surprise was over——

Miss **Schneider**. Good.

Dr. **Graham**. By my fellow delegates, and has since been the—and was remanded to the—to their Standing Committee on Science and Technology, which has now held two rounds of meetings on it. And we hope we'll have a final version of the framework to propose to the OECD's Council of Ministers—the senior ministers—when they meet in May. That is a specific framework which I think will have great implications for international cooperation in terms of strengthening it, in strengthening the—the general sense of—of cooperation among nations in scientific research in the future.

I mentioned the "Bird" book. There's also the Packard-Bromley report on the health of the universities.

Miss **Schneider**. Right.

Dr. **Graham**. We released a report just recently on high performance computers and networks, which discusses the future of that field. Those are a few of the specific tangibles, but they——

Miss **Schneider**. Did I——

Dr. **Graham**. They make up only a—only a fraction of the overall activities we're involved in.

Miss **Schneider**. I understand. But this is helpful for each of the members of the Science and Technology Committee because I think it's partially our responsibility as we go out and speak to different groups to be able to know specifically what it is you've accomplished and to at least cite those areas of activity.

I wonder if you—I always believe that one of the best ways to operate, particularly as we are dealing with science and technology in the global economy, is to go through my own personal strategy, which is to preempt, to set goals, and to measure progress.

Are there any areas internationally where you can specifically point to OSTP's involvement where we have preempted other nations in—in any kind of move?

Dr. **Graham**. Preempt in what sense?

Miss **Schneider**. Preempt, perhaps, in the area of—it seems quite obvious that your framework for international cooperation is a preemptive move in setting some guidelines. I mean, that's one example that you've already cited that would come to mind.

But as we know, our greatest competition for the development of—of science, research and technology is, for the most part, with the Japanese—to some degree the Germans. They're working in a whole series of areas, and I can list for you those areas where the United States falls behind, whether it be in materials research, or whether it be in the development of a variety of different biogenetic engineering products, or whatever.

Is there anything that OSTP has been involved in where we have sort of jumped the gun on our international competitors?

Dr. **Graham**. Well, we've taken a lot—a very strong initiative in the high-temperature superconductivity area, both inside the government research and in our interface with the—with the industrial and the university world as characterized by the conference we held last summer.

In terms of dealing with other countries specifically, a year ago I went to Japan leading a delegation of various government agencies to—to discuss with the Japanese the importance of our overall science and technical—technology—relationship with them being strongly reciprocal, and having an overall balance, and mutual benefit; and said that I thought overall that we did not have that balance and that there was more technical outflow from the United States than technical inflow from Japan—and that would serve neither of us well in the long run.

So as we came to the renewal of our science and technology agreement—Presidential level agreement that had been negotiated by Dr. Press—that we were—we intended to make it manifestly and specifically characterized by this overall balance and reciprocity of involvement and benefit.

OSTP has been leading the negotiations in this—and the—the U.S. group overseeing the negotiations since that time. In fact, we took the lead in drawing up a draft agreement and having it—and it was then reviewed and approved by the Economic Policy Council with other councils sitting in attendance at that time—and we've been pursuing that very vigorously with the Japanese since that time.

Miss **Schneider**. Okay.

Mr. **Graham**. The balance is characterized today in some ways by the fact that the Japanese have on the order of 13,000 of their—of their people in this country studying and doing research. We have about on the order of 700 in Japan. Part of that is because we haven't been aggressive enough in going there, and part of it has been because we haven't had all of the opportunity there that we've presented to others in this country. I intend to see that this situation change.

We don't want to diminish the access people have to the United States. We want to increase the access we have to other countries so that there is an overall balance and we can work on something that's to both our benefit.

Miss **Schneider**. Good.

I'd just like to leave you with some of—priorities that I think reflect some level of vision. And it seems to me that OSTP's responsibility, as stated in the legislation which established it, it says here: The primary function of the Director is to provide within the Executive Office of the President advice on the scientific, engineering, and technological aspects of issues that require attention at the highest levels of government.

Might I recommend that there are three issues that I believe to be at the highest levels of government that should take our consideration. And it concerns me that much of the emphasis, I believe, that OSTP has been putting forward, focuses more on energy and technology as opposed to some of the scientific, particularly in your first area having to do with health care, more specifically, with AIDS.

This country, more than any other country in the world—except perhaps for maybe Africa—has a great deal at risk insofar as this disease is concerned. The same thing with cancer research. Armand Hammer publicly made the announcement that if the Federal Government would provide $500 million, then he would raise matching $500 million to wipe out cancer.

There seems to be a lag in any kind of focus, insofar as I'm concerned, in terms of a strong policy directive backed up by research dollars, particularly when we look at the fact that NIH cannot even finance 40 percent of all the grants that have been approved—not the ones that have been rejected, but the ones that have been approved—less than 40 percent actually get the money. I think that's a pretty sad commentary as to where, you know, some of our priorities are.

Secondly, in the area that I think has—should be given attention at the highest level of government, and is getting attention now by the World Bank and many world leaders, and hopefully the leaders of the United States—as a result of the piece of legislation I just moved through the House last year, and that is calling on the President to call for in the International convention on biological diversity.

I think that if we have some vision we can recognize the ramifications of the rapid loss of our tropical rain forests. It has enormous economic implications, particularly to the pharmaceutical industry, enormous ramifications insofar as materiels research is concerned, and a whole broad spectrum of other scientific endeavors—not to mention the fact that if we assume that we will be able to depend on biogenetic engineering and at the same time lose the germ plasm that can be found in many of these areas where we have not even begin to even identify many of the plants and animals—it's like burning libraries. We don't even know what books are in those libraries but they are being destroyed.

So, I think that the fact that the World Bank has initiated a program, with the support of the Secretary of the Treasury, for debt swap is a way of solving two problems at once: it will help to maintain some biological diversity, at the same time help reduce the debt of the developing nations.

The third area is one that relates more to technology transfer and application of a bird in hand. We all—and that is energy efficiency technology, where the Japanese are beating the pants off of us. We have in hand right now enough energy efficiency technology to save this country $150 billion a year. Imagine what that would do to our trade deficit.

So, I think the fact that you have a very unique and special opportunity as interagency coordinator, as Science Adviser, as one who can bring some vision and some pooling together of the various challenges that we have, and looking with a vision toward some of those global challenges—I think in those three areas we—one is fire fighting. Certainly AIDS is a crisis we need to content with right away.

The other two are preemptive strokes, I believe—and energy efficiency technology certainly relies to our—relates to our national security—and the $50 billion that we're spending in the Persian Gulf now and all the other foreign policy questions that are involved. They are all intertwined.

So I think that if you could take my humble recommendations for three items that I believe would be terrific on your priority list, that would be greatly appreciated. And in any way I can lend some support, I am most enthusiastic to do so.

Thank you.

Dr. **Graham**. Thank you very much. I think those are very serious topics and we will work with you on those.

Miss **Schneider**. Good.

Mr. **Walgren**. The gentlelady's time has expired.

Thank you very much, Dr. Graham, we appreciate your being with us.

Dr. **Graham**. Thank you, Mr. Chairman.

Mr. **Walgren**. We will call the next panel. Dr. Frank Press, who is unable to be with us today, has submitted written testimony that will be made part of the record, without objection.

[The prepared statement of Dr. Press follows:]

NATIONAL ACADEMY OF SCIENCES

2101 Constitution Avenue Washington, D.C. 20418

OFFICE OF THE PRESIDENT

February 2, 1988

The Honorable Doug Walgren, Chairman
Subcommittee on Science, Research, and Technology
Committee on Science, Space, and Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Doug:

I very much regret that I cannot participate in your oversight hearing on OSTP on February 17. An Advisory Council meeting is scheduled for early that afternoon at our new Beckman Center in Irvine, and the number of Council members who have arranged their schedules to attend makes it impossible to pick another date. Similarly, I understand that your Subcommittee's full agenda leaves little flexibility.

Although I am not convinced that legislative changes in the structure or mandate of OSTP are desirable, I do believe that a thorough review of the science advisory apparatus in the Executive Office, in light of the challenges facing the next administration, is timely and important. Thus, I commend your decision to examine the future role of OSTP, independent of the full Committee's annual "posture hearings."

The same concerns have led us to think about convening a special Academy panel, similar in composition and focus to the 1974 Killian Committee on Science and Technology in Presidential Policymaking, to prepare a white paper for the next administration.

I look forward to discussing this with you. Once again, my sincere apologies for having to decline your invitation for the 17th.

Sincerely,

Frank

Frank Press
President

Statement of

Frank Press, President

National Academy of Sciences

before the

Subcommittee on Science, Research, and Technology

of the

Committee on Science, Space, and Technology

U.S. House of Representatives

February 17, 1988

Mr. Chairman and Members of the Subcommittee:

Although I regret that I am unable to appear before the Subcommittee in person, I appreciate the opportunity to present my views for the record of this oversight hearing on the Office of Science and Technology Policy (OSTP) and the National Science and Technology Policy, Organization, and Priorities Act of 1976. Now that we are beginning to prepare for a new administration, it is appropriate and timely for Congress to review the experience of the past and to assess the role of the Office and the Act in the future.

The role of scientific and technical expertise in Presidential policymaking is, of course, a matter of great personal interest on which I have strong views. It is also a matter of great national importance. The leader, especially of a superpower, who lacks close scientific advisors with understanding of the technical complexities underlying the issues he or she must decide places his country -- and, indeed, the world -- at risk, not merely of military destruction or environmental degradation, but also of economic stagnation and an inferior quality of life for its citizens.

It is noteworthy that General Secretary Gorbachev was accompanied to the summit meeting in Washington with President Reagan by eight distinguished members of the Soviet Academy of Sciences -- scientists, economists, and legal scholars. During their visit, we had an opportunity to host this delegation at the

National Academy of Sciences for a remarkably frank give-and-take on developments in Soviet society and problems of mutual concern -- AIDS, global climate change, and the slowdown of economic growth. We found the Academicians knowledgeable, candid about the previous Soviet regime's mistakes, and receptive to a dialogue. That General Secretary Gorbachev travels with that kind of entourage is an encouraging sign of the radical changes afoot in the Soviet Union.

Similarly, the President who takes office next January will have little choice but to seek out scientific and technical advice on a wide range of issues confronting his administration.

Growth and Competitiveness. The future economic success of the United States depends more than ever on the development and use of new knowledge. Candidates of both political parties appear to recognize that fact and the agenda that follows from it. We face an enormously challenging task in educating the American workforce for a technological age in which the United States no longer dominates discovery and innovation. This means not only training a new generation of scientists, engineers, and technicians but also improving the skills of people who enter the labor market after high school. The latter have serious deficiencies in literacy and quantitative skills; and although the best American students are superior by any standard, the apparent decline in the numbers choosing technical professional careers is worrisome.

Fierce foreign competition places a premium on the rapid application of new knowledge to new products, processes, and services. Boundaries between basic and applied research are being eroded, and in many fields the time between discovery and its commercialization is now measured in years rather than decades. The United States, although still at the forefront of science and technology, appears to be slipping behind in the development and diffusion of some core technologies. We need to accelerate the process of commercializing new knowledge, but we need to do so in a manner that preserves the serendipitous, free-wheeling style of productive science. The next administration will face a host of difficult choices in allocating resources, not only among scientific fields but also among modes of doing research.

Global Environment. Global environmental issues will loom very large in the next decade. The ozone hole must be monitored closely. Despite an international agreement limiting production of fluorocarbons, we may have to take additional steps to curb ozone depletion. And if it is the case that CO2 concentrations will trigger climatic change, now is the time to start thinking seriously about energy alternatives to the combustion of fossil fuels. This could mean a deliberate change in the world economy as profound as the Industrial Revolution. We need, too, a more vigorous action program to address acid rain now that we understand the major causes of the acidification of lakes.

Space. Looking back on our huge investments in space and our our once unassailable world leadership position, it is disheartening to realize that we can't fly the equipment that we have built for either defense or civilian purposes. What clearer sign could there be of our diminished capacity? And once we regain that capability, there will be issues of public versus private investment, of military versus civilian priorities, and of manned versus unmanned exploration to resolve. The President's space policy paper released last week addresses some of these issues. The Europeans and the Japanese, not to mention the Soviets, have shown their intention to play a leading role in space. They have made their choices, for commerical and intellectual reasons as well as national prestige.

National Defense. The next administration must decide anew the direction of SDI research, its level of funding, and in due course a policy for negotiation or implementation. The INF treaty will usher in a new era in arms control negotiations, with a focus on strategic and conventional forces. A decision needs to be made about the aging defense production reactors, but with what designs and technology? In the meantime, should recent changes in the share of basic research in defense R&D and the balance between military and civilian R&D investment be readjusted?

This is obviously a partial, not an exhaustive list of challenges facing the next President. But the subject of this hearing is process and organization rather than substance. The question is how to structure and access the kind of advice he will require.

In my view, past experience offers no completely satisfactory model. I believe that it is essential to the success of any administration to elevate the status and access of the science advisor in White House policymaking. The times demand it! My preferences are straightforward:

o The President's science advisor should be named as an Assistant to the President, a very high level position denoting the President's personal trust and confidence. A presidential assistant has ready access to the oval office and the cabinet departments. Being in the Executive Office but not of the immediate White House staff does not afford sufficient involvement or influence in presidential policymaking. Failing this arrangement, the science advisor should be given a cabinet position without portfolio. The utility of this option depends very much on the President's reliance on his cabinet officers, individually, collectively, or through cabinet-level councils. Recent Presidents have entered office declaring their strong support of cabinet government but have reneged on that commitment, relying instead on a close circle of personal assistants.

- Because the agenda is broad and any individual's expertise limited, the office of the science advisor unquestionably needs a strong professional staff of 25 to 35 members. These should be full-time people, not begged and borrowed from other agencies. And while blurred lines of authority are often problematic, I think it is useful to have a few joint appointees, for example, with the staffs or the National Security Council or the Council of Economic Advisors.
- Even with a competent professional staff, the science advisor and the President will need close contacts with the best scientists, engineers, and physicians in the country. On the issues that require the best technical advice available, expertise will mostly be found outside the government. The President's Science Advisory Committee (PSAC) worked well only intermittently. President Carter preferred to use ad hoc committees of experts convened on an issue by issue basis. President Reagan introduced the concept of a White House Science Council to support the science advisor. These concepts suit the mode of deliberation in the scientific community and are therefore worth considering, albeit with changes. For the original PSAC concept to work, the members would have to make a

substantial commitment of time. A pro forma two or three days a month is barely sufficient to become thoroughly briefed, let alone to formulate and render considered judgments. Moreover, it is in the nature of the presidency that fully briefed advisors must be willing to abstain from public criticism of the President's positions while in office.

o Finally, the office requires a budget of a few million dollars, to cover the cost of special analyses and independent research. The science advisor should not have to depend on funds from agencies with a vested interest in the outcome of White House decisions.

I believe that most of the current presidential aspirants and the Congress are ready to elevate the role of the science advisor. There is a growing recognition of the interconnectedness of science and technology and the nation's foremost concerns and opportunities. But it would be naive to assume that the arrangement I have outlined resolves all of the tensions that have been inherent in the position since the first incumbent. In some respects, it exacerbates them.

First, there is a tension between professionalism and politics. It goes almost without saying that a President will arrange the White House staff in a way that suits his personal style and method of operation. In most cases, his assistants will be close political confidants. Political involvement and acumen are not normally associated with the technical professions, but it is entirely possible for a distinguished scientist or engineer to combine political sophistication with a high degree of professionalism and integrity.

Second, the position of science advisor embodies tension between its function and the expectations of the scientific community. The perception that the incumbent regards himself or herself as the resident advocate of particular interest groups, whether academic or industrial, will almost certainly be fatal to his or her influence in the long run. Constituency representatives on the White House staff have not been effective participants in policymaking.

Third, there is a tension between proximity to the President and responsibility to the Congress. To be successful, the science advisor must always accord the former greater weight. Indeed, as an intimate and fully briefed member of the President's inner circle, there may be times when it is appropriate to invoke executive privilege. Congress was well-intentioned in reestablishing the office through the National Science and Technology Policy, Organization, and Priorities Act; but there are limits to which legislation can dictate the structure of the White House operation or correct perceived flaws in it.

Finally, there is a tension between providing competent technical advice on issues requiring near-term action and engaging in long-range planning. Although science and scientists are by nature anticipatory, in the White House environment the exigencies of the former will almost always force the latter down the agenda. Expectations that the Office of Science and Technology Policy would undertake strategic planning as a top priority were unrealistic. There is an inevitable trade-off between proximity to the President and the ability to engage in long-term analysis. The successful science advisor will be involved in both short-term and long-term matters. He or she will set priorities as each issue demands in a manner most helpful to the President.

These tensions have no simple, entirely satisfactory solutions. Moreover, in varying degrees they characterize science policymaking throughout the government, not only at the top. Over the next few months, we at the National Academy plan to take a fresh look at these issues in light of changed circumstances since the 1974 report of the Academy's influential Killian panel, which recommended creating a White House unit to provide scientific and technical advice. We have in mind producing a similar white paper for the incoming administration. We look forward to soliciting the views of and sharing our conclusions with the Subcommittee as we progress.

Mr. **Walgren**. Dr. Edward David, the president of EED, Inc.; Dr. Donald Hornig, director of Interdisciplinary Programs in Health at the Harvard School of Public Health; and Dr. John McTague, vice president of Ford Motor Co. Gentlemen, if you would join us at the table.

After having gone on for 1 hour and 45 minutes with one, first witness, I hesitate to rein anybody on the time, in fairness to each other. At the same time, we do have 10 more witnesses to hear today. And in fairness to those who are listening and the like, I'd just like to raise that point.

As you know, your written statements will be made part of the record. Please feel free to focus and underscore individual points that you would like to emphasize. Let's proceed in the order in which I introduced you to the record. Dr. David.

STATEMENTS OF DR. EDWARD E. DAVID, PRESIDENT, EED, INC.; DR. DONALD HORNIG, DIRECTOR, INTERDISCIPLINARY PROGRAMS IN HEALTH, HARVARD SCHOOL OF PUBLIC HEALTH; AND DR. JOHN P. McTAGUE, VICE PRESIDENT, FORD MOTOR CO.

Dr. **David**. Mr. Chairman, I appreciate the opportunity to come here today and speak to the issues that you've posed.

I think it's very easy, and in some quarters it has become quite fashionable, to criticize OSTP and its Director.

As you know from reading elsewhere, OSTP has been blamed for everything from the *Challenger* accident to the loss of U.S. competitiveness. And certainly I would say OSTP is not beyond criticism. But it may well be that people are expecting too much from it, especially considering the paucity of resources that are available to it.

I think the question is, What should we expect, and how can we assure performance to realistic expectations?

Of course, OSTP is the staff support for the President's Science Adviser, and its basic functions were laid out in the 1976 legislation, which originated with this committee. Within these statutory functions there're certain things that are more important than others, and let me list a few that are on the top of my list.

First of all, OSTP should be providing a presidential rationale for actions that span Federal departments and agencies. And this has been a traditional role for OSTP, using now FCCSET, and earlier something that was called FCST.

This role is becoming ever more crucial because the Federal Government is faced increasingly with matters which transcend the missions of the concerned agencies and departments. And the lead agency concept, which is used quite often, can't satisfy what appear to be the conflicting interests of the contending players.

I think to reconcile these diverse viewpoints, OSTP has to take a stance which is above and yet part from the fray. It should represent the President's overarching perspectives, not only in domestic matters but also in international matters.

Second, OSTP must support participation by outstanding members of the scientific and engineering communities in advising the President or the Science Adviser on technical matters. Wide participation by these communities, I think, is essential; because, no matter how competent the OSTP staff is, it cannot be up and modern on all of the latest knowledge and technique.

In turn, I think the OSTP staff should provide these outside people with the savvy that they need to interact effectively with the Federal, and particularly the White House, bureaucracy.

And, of course, OSTP should provide the staff work and analysis that the Science Adviser needs to a point his task, and that implies, as has already been said here this morning, close relationships with the NSC, the EPC, the OMB, and the other elements of the White House staff.

And you can think of other functions for OSTP—for example, in technology transfer and in commerce. These call for a cohort of highly professional people with the longevity and continuity to know how to work within the system.

In many ways, of course, the OMB staff fits this same profile. And as a fine example, let me just mention the competence and effectiveness of a single person that I've known for a long time in OMB, Mr. Hugh Loweth, who recently retired. He tended science and technology, in my opinion, responsibly, during his many years of service at OMB. His knowledge of the system and its history were invaluable to White House science advisers. The question is: How can we cultivate a continuing generation of people like that?

I've suggested one possible way in a recent article which I wrote for William Golden's book on science advice which will be published very soon. This way envisions replacing OSTP with a Federal Contract Research Center chartered specifically to serve the White House.

I will not go into detail here about the advantages and questions that this proposal raises. But suffice it to say that R—FCRC's have a track record of attracting and retaining some of the best engineering and scientific talent. FCRC's can take an independent view and so be above the political fray. Of course, my opinion is that we would still need a Presidential Science Adviser, aided by a small staff.

Now regardless of this proposal, which does have its downside, there's another more central point to be made. I think it's evermore essential for science and technology to be on a par with economics and national security in the White House. In my opinion, the cardinal issue for the Nation today is economic competitiveness. And science-based technology is the key, not only for attaining this goal, but but also for achieving national security and domestic well-being.

Currency exchange rates and other economic variables may provide some temporary, short-term relief to our problems, but unsurpassed technology is the essential for the quality, productivity, and innovation to compete internationally.

Just as vital as international competitiveness is education at all levels. The Nation can't compete without continually renewing its stock of scientists and engineers, and without a citizenry which can participate knowledgeably in affairs where technology is a driving force.

However, I have to say that I don't think science and technology are considered by many managers and many politicians as prime resources in attaining their goals. Thus bringing science and technology to their proper standing in the White House or elsewhere will require substantial changes in attitudes and judgments.

A fine first step, I think, would be to elevate the Science Adviser to Cabinet rank without portfolio. And the next President should appoint his Science Adviser with dispatch, rather than waiting months as has happened in recent administrations. These tardy appointments, I hasten to say, did not reflect intentional neglect but merely a lack of rapport between new Presidents and any competent science or engineer.

An increased role for science, as I've tried to outline quickly here, implies really a more vigorous role for OSTP, and one that goes beyond that that was envisioned in the 1976 legislation.

In the early days of OST, the White House science apparatus was the dominant player in the—in the Federal spectrum by default. Even DOD lacked competence in scientific and engineering subjects. Today, that's no longer the case. Significant competence exists in most departments and agencies. Primary competence exists in most of industry, which must be the locus—the primary locus—of the competitive response. Thus the role of OSTP and the whole White House science apparatus should be quite different from years past.

Today's role is less direct, less involved with technical detail, and more on the level of policy and the setting of newly attainable goals. For example, I think the Nation would like to see a series of well-founded science and technology policy statements, with the President's imprimatur, emerging from the White House.

The Nation would respond well to an increased science and technology content in other policies as well. This committee should note, in my opinion, that the OSTP today has neither the funding or the charter to carry out its increased and more vigorous role as I've sort of outlined it here.

Let me point out that I, as Director of OST in the 1970's, had 50 professional people—that includes detailees—and a budget of over $2 million.

Today, as you already know, 18 years later, the numbers are fewer than 20 professionals and less than $2 million—not counting for inflation.

Furthermore, OST no longer has a clear mandate in international science. But even with a strengthened OST, we should not expect it to manage projects or to operate specific programs, nor should we expect it to keep departmental and agency activities out of trouble.

We can't expect OSTP to pioneer commercial technology of competitiveness or for other purposes. OSTP can contribute to such aims as seeing that competent people are in place in Federal R&D positions, by seeing that enlightened Federal policies are in place, by leading the agencies and departments toward construcive approaches to cross-cutting issues, by encouraging innovation—innovative—problem-solving, and by encouraging excellence in education.

In these roles, OSTP will play—be playing honest broker for technical ideas and their implications. To be effective, it should avoid being put in the role of political advocate. If it were to assume that role, it would merely become one of many supplicants.

In conclusion, OSTP or its replacement is increasingly essential in the White House. Its role should be one that focuses on the wider goals and visions of the President. This committee, I think, should see to it that the resources and the mandates to be effective are in place.

Thank you, Mr. Chairman.

[The prepared statement of Dr. David follows:]

WRITTEN TESTIMONY

Dr. Edward E. David, Jr.,

President, EED Inc.

Testimony Before the Committee on Science,

Space and Technology

U.S. House of Representatives

Hearings on the Office of Science & Technology Policy

February 17, 1988

It is very easy, and in some quarters fashionable, to criticize OSTP and its Director. As the members of the Committee know, OSTP's performance has been blamed for a startling variety of ills from the space shuttle tragedy to the loss of U.S. industrial competitiveness. Certainly OSTP is not beyond criticism, but it may well be that people are expecting too much, especially considering the paucity of resources available to it. What should we expect and how can we assure performance to realistic expectations?

OSTP, of course, is the staff support for the President's Science Adviser, and its basic functions were laid out in the 1976 legislation (originating with this Committee) which established it. Within these statutory functions, there are those which are more urgent and important than others. Let me just mention some that top my list.

First, OSTP should be providing a Presidential rationale for actions that span Federal Departments and Agencies. This has been a traditional role for OSTP, using FCCSET and earlier FCST as well as other mechanisms. This role is becoming ever more crucial, for the Federal government is faced increasingly with matters which transcend the missions of concerned agencies and departments. The lead agency concept often cannot satisfy what appear to be the conflicting interests of the contending players. To reconcile these diverse viewpoints, OSTP must be above and yet part of the fray. It should represent the President's overarching perspectives, not only in domestic matters, but also in international science.

Second, OSTP must support participation by outstanding members of the scientific and engineering communities in advising the President or the Science Adviser on technical matters. Wide participation by these communities is essential since the OSTP staff, no matter how competent, cannot bring to bear all the latest knowledge and technique. In turn, the OSTP staff should provide these outside people with the savvy they require to interact effectively with the Federal, particularly the White House bureaucracy.

Of course, OSTP should provide the staff work and analysis that the Science Adviser needs to perform his tasks. This role means that the OSTP should have close working relations with the NSC, the EPC, the OMB, and other elements of the White House staff.

This Committee can think of other functions for OSTP; for example, in technology transfer and commerce. These call for a cohort of highly professional people with the longevity to know how to work within the system. In many ways, the OMB staff fits this same profile. As a fine example, let me just mention the competence and effectiveness of Mr. Hugh Loweth, recently retired from OMB. He tended science and technology responsibly during his many years of service in OMB. His knowledge of the system and its history was invaluable to White House science advisers. How can we cultivate continuing generations of such people?

I have suggested one way in a recent article written for William Golden's book on science advice which will be published soon. This way envisions replacing OSTP with a Federal Contract Research Center (FCRC) chartered specifically to serve the White House. I will not go into detail here about the advantages and questions that this proposal raises. Suffice it to say that FCRC's have a track record of attracting and retaining some of the best engineering and scientific talent. And FCRC's can take an independent view and so be above the political fray. Of course, there should still be a Presidential Science Adviser, aided by a small staff.

Regardless of this proposal (which does have its downside), there is another more central point to be made. It is ever more essential for science and technology to be on a par with economics and national security in the White House. In my opinion, the cardinal issue for the nation today is economic competitiveness. And science-based technology is the key not only for attaining this goal but also for achieving national security and domestic well-being. Currency exchange rates and other economic variables may provide some temporary, short-term relief, but unsurpassed technology is the essential for the quality, productivity, and innovation to compete internationally.

Just as vital is education at all levels. The nation cannot compete without continually renewing its stock of scientists and engineers, and without a citizenry which can participate knowledgeably in affairs where technology is a driving force.

However, science and technology are not considered by most managers and politicians as prime resources in achieving their goals, nor as drivers of policy. Thus bringing science and technology to their proper standing will require substantial changes in attitudes and judgments. A fine first step would be to elevate the Science Adviser to Cabinet rank without portfolio. And the next President should appoint his adviser with dispatch, rather than waiting months as has happened in recent administrations. These tardy appointments did not reflect intentional neglect but merely the lack of rapport between new Presidents and any competent scientist or engineer.

An increased role for science implies a more vigorous role for OSTP, one that goes beyond that envisioned by the 1976 legislation. In the early years of OST, the White House science apparatus was the dominant Federal player by default. Even the DOD lacked competence in scientific and engineering subjects. Today, that is no longer the case. Significant competence exists in most Departments and Agencies. Primary competence exists in most of industry, which must be the locus of the competitive response. Thus the role of OSTP and the whole White House science apparatus should be quite different from years past. Today's role is less direct, less involved with technical detail, and more on the level of policy and the setting of newly attainable goals. For example, I think the nation would like to see a series of well-founded science and technology policy statements, with the President's imprimatur, emerging from the White House. The nation would also respond well to an increased science and technology content in other policies. This Committee should note that OSTP today has neither the funding, nor the charter to carry out its increased, more vigorous role. Let me point out that I, as the Director of OST in the 1970s, had 50 professionals and a budget of over $2 million, not accounting for inflation. Furthermore OST no longer has a clear mandate in international science. This Committee's influence in righting these shortfalls is essential.

Even with a strengthened OSTP, we should not expect it to manage projects or to operate specific programs. Nor should we expect it to keep Departmental and Agency activities out of trouble. We can't expect OSTP to pioneer commercial technology for competitiveness or other purposes. OSTP can contribute to such aims by seeing that competent people are in place in Federal R&D positions, by seeing that enlightened Federal policies are in place, by leading the agencies and departments toward constructive approaches to cross-cutting issues, by encouraging innovative problem-solving, and by encouraging excellence in education. In these roles, OSTP will be playing honest broker for technical ideas and their implications. To be effective, it should avoid being put in the role of political advocate. If it were to assume that role, it would become merely one of many supplicants. In conclusion, OSTP or its replacement is increasingly essential in the White House. Its role should be be one that focuses on the wider goals and visions of the President. This Committee should see that it has the resources, the mandates, and the status to be effective.

Dr. Edward E. David, Jr. is President of EED, Inc., consultants to industry and government on technology and research management. His previous positions include Science Advisor to the President of the U.S.; President, Exxon Research and Engineering Company, Executive Director, Bell Telephone Laboratories; and Executive Vice President, Gould, Inc. He is the recipient of twelve honorary degrees and has received numerous awards. Dr. David is currently a member of the National Academies of Science and Engineering, the White House Science Council, the New Jersey Commission on Science and Technology, and the U.S. delegate to the NATO Science Committee.

Mr. **Boehlert** [presiding]. Dr. Hornig, why don't you proceed? This is not an insurrection. I'm not taking over the Committee.

Dr. **Hornig**. Mr. Chairman, members of the Committee:

My name is Donald Hornig and I am a professor in the Harvard School of Public Health. However, my competence to discuss OSTP and my interest in science advice at the highest levels of the government is derived from my earlier experience. I was a member of the President's Science Advisory Committee under Presidents Eisenhower, Kennedy and Johnson and Director of the—wait a minute—and was named Special Assistant for Science and Technology and Director of the Office of Science and Technology by President Kennedy just 2 weeks before his assassination.

Subsequently, I was appointed to the same posts by President Johnson and remained there from 1964 to 1969. My experience, obviously, may be somewhat outdated by now. But any rate, I shall discuss OSTP on the basis of that experience.

It seems to me that this is an appropriate time to review the functions of OSTP and its statutory base. Public Law 94-282 was enacted at the initiative of the Congress after 4 years, during which there was no science office in the White House, and a long series of hearings that reviewed the needs of the President, the Congress, and the public, setting forth findings concerning the role of science and technology in the Nation's affairs, a set of national goals, a statement of national policy for science and technology.

It's hard to take issue with any of these principles or the proposed implementation, even after a dozen years of experience. However, the OSTP established by the act was charged with many more responsibilities than could reasonably be carried out by any small office in the Executive Office of the President operating on a limited budget.

Some of the activities in the original act have since been transferred to NSF and OMB. But even then the question is whether the remaining functions assigned to OSTP are—are double. And if so, whether they are—the most significant ones are being addressed, and then the question of how the capabilities of the office would be increased.

Now, I'm not acquainted in any detail with the current activities of OSTP. Still, from what I have learned, and seen, and talked to people about, I, along with many members of the scientific community, see little to suggest that OSTP has helped to shape significant programs or policies of the Federal Government recently. Or that it is drawing in many elements of the scientific community.

Now, this is not meant to be critical of Dr. Graham and his colleagues. There's little evidence—at least to me—that the current President and his staff seek to involve OSTP in their decisions.

Now, if that is the case, I am not sure what can be done to make OSTP effective—no matter what the structure of the office or the qualities of the Director.

Perhaps we should ask once more whether a statutory science office is needed in the Executive Office. It hasn't always been that way.

What must the office do to make the President depend on it in the way President Eisenhower depended on what he called "my scientists."

An effective OSTP must be, above all—help the President to carry out his awesome responsibilities as political leader, as Chief Executive, and as Commander in Chief.

OSTP should be a part of the presidency. And should not undertake tasks which can be done as well either by OMB or by the various agencies of the government. It must provide the President and those around him specialized and professional talent for use in formulating policy and actions. It must also bring matters to the President's attention which—of which he might otherwise be unaware.

It is surely a fact that except for OSTP, there is no group in the White House which can deal authoritatively with, for example, the technical problems and limitations of SDI, or the problems that have been discussed, of the technological competitiveness of American industry and the manner in which the Federal Government might contribute to improving that competitiveness, or to the health risks brought about by environmental pollution. Economic, social, and legal experience is abundant in the White House and in the contacts of the White House.

But absent OSTP, who can make the very best scientific and technological expertise available to the President and those about him?

It is obvious that I think OSTP can play an important role. And what I've never understood—and still don't—is why this does not seem to be self-evident to Presidents.

OSTP is assigned—though two very different goals in the act. The first, which I have referred to so far, is to provide advice and assistance to the President as political leader.

Another quite different function is to assist the President in the—in managing the enormous scientific and technical enterprise. This includes $60 or $70 billion—I don't know the exact figure—of federally funded research and development in industry, in universities, Federal laboratories, and contract establishments.

It also includes, and very importantly, the creation of a climate which will stimulate industrial innovation and strengthen universities. I think this is most important—is the stimulation of a national climate of doing things rather than simply managing things.

Now, one of the difficulties, though, is that in addition to providing strategic guidance for Federal programs relating to scientific and technological progress, the act calls on OSTP to carry out, and I quote, "an annual review and analysis of funding proposed for research and development in budgets of all Federal agencies."

Now, I submit that taken literally, that's a task that even OMB can't do very well and is certainly an impossible one for a group—small group—of 10 or 20 people.

Now, this dichotomy between these two very different goals produces a competition, I am sure, within the Office. It always did in the past—because this isn't a new phenomenon. It produces a competition for staff attention. Since it's hard for the staff to derive much personal satisfaction from inputs to policymaking—that's a very mushy kind of business—while innovations in the conduct of programs or in the determination of budgets produces an immediate sense of accomplishment, the short range programs with immediate impact tend to absorb available time and effort, and thus detracting from the longer range analysis and planning we all want.

I see no need to change the legislation on this account. However, I believe OSTP should be encouraged to look beyond the immediate questions which face the government and focus on significant issues which transcend the capabilities of the individual agencies in which—which may require the oversight of the Executive Office.

I have two final points. The first is that OSTP ought to be, in fact, I should say, must be a link between the Executive Office and the ablest elements of the scientific and technological community on the outside. This requires on the one hand that the Director and his staff be members of the White House team who carry weight in the give-and-take of White House and Executive Office discussions.

On the other hand, their scientific stature must be such that they are respected in the world of science and technology.

In the past, this stature was maintained, among other things, through a distinguished President's Science Advisory Committee—PSAC—and its specialized panels, which also maintained a broad spectrum of that general context.

Now, I'm not sure, as times have changed, whether it is possible to revise PSAC—probably not in its previous form. But some such device which would bring our very best minds to bear on the problems of the Presidency in the country, and for the Congress, and which would provide a source of both stimulation and balance for the Director of OSTP, is, in my mind, a necessity.

A second point is that OSTP must act as a point of contact between the agencies and the White House on scientific and technological matters; must convey the needs of the White House to the agencies; must also digest and interpret studies carried out in various agencies, such as the Department of Energy, National Science Foundation, as well as the National Academy and National Research Council, and relate them to the issues of concern to the White House.

Another point is that, when one relies on the agencies, the submissions from the agencies frequently reflect their special interests, so that OSTP and its consultants may have to step back on behalf of the President and put matters in perspective.

Altogether I'm pleased that this distinguished Committee is reviewing the operations of OSTP. I think the OSTP is necessary and offers much to the country.

Now, the interest and support of this Committee as well as its un—questions will undoubtedly strengthen this Office, particularly next year when it is off to a fresh start at the beginning of a new administration.

Thank you very much.

[The prepared statement of Dr. Hornig follows:]

Subcommittee on Science, Research and Technology
Oversight Hearing on OSTP, February 17, 1988

Statement by Donald F. Hornig

Mr. Chairman, members of the Committee. My name is Donald Hornig and I am a Professor in the Harvard School of Public Health. However, my competence to discuss OSTP, and my great interest in science advice at the highest levels of government, is derived from my earlier experience. I was a member of the President's Science Advisory Committee under Presidents Eisenhower, Kennedy and Johnson and was named Special Assistant for Science and Technology and Director of the Office of Science and Technology by President Kennedy, just two weeks before his assassination. Subsequently, I was appointed to the same posts by President Johnson and remained there from 1964 to 1969. I shall discuss OSTP on the basis of that experience.

It seems to me that this is an appropriate time to review the functions of OSTP and its statutory base. Public Law 94-282 was enacted after a four year hiatus during which there was no science office in the White House. It was enacted at the initiative of Congress after a long series of hearings spanning several years in the absence of a compelling demand for such an Office by the President. The OSTP set up by PL 94-282 reflected the many needs of the President, the Congress and the public and in the end it was charged with more duties than was feasible or desirable to carry out by a small office in the Executive Office of the President. This has been recognized by subsequent Presidents and some of those functions have been transferred by Executive Order to the National Science Foundation and to the Office of Management and Budget. The question now, after ten years of experience, is whether OSTP is carrying out the role which was intended and if not, how it might be strengthened.

I must confess that I am not acquainted in any detail with the current activities of OSTP. I am not aware of the areas in which it has worked recently, the reports which may have been prepared under its auspices, or the advice it may have offered to the President and other agencies of the government. This may be my fault but my perception is that many members of the scientific community see OSTP in the same light. They are not aware of a flow of scientific and technological expertise into the Office and they see little or no evidence that the activities of the Office have helped to shape significant programs or policies of the federal government.

This is not meant to be critical of Dr. Graham and his colleagues. I am keenly aware that OSTP is part of an interacting group of offices and advisors in the Executive Office of the President and the White House Office. There is little external evidence that the current President and his staff seek to involve OSTP. If that is the case I am not sure what can be done to make OSTP effective, no matter what the qualities of the Director.

Perhaps one ought to start by asking once more whether a science office is needed in the Executive Office. What functions can it and should it perform which are needed by the President and which will make him depend on it in the way President Eisenhower depended on what he called "my scientists."? This is critical. If there is to be an effective OSTP it must help to carry out the responsibilities of the President as a political leader, as the Chief Executive and manager of an enormous and expensive enterprise, the U.S. government, and as the Commander in Chief of the armed forces. It should be a part of the Presidency and should not undertake tasks which can be done as well in the Cabinet Departments or Independent Offices.

Much of what has been said and written about the White House science office focusses on a function best described as the job of a Special Assistant for Science and Technology. This is the job of advising the President and those around him of the scientific and technological considerations which are essential to forming sound judgements on matters he considers significant. A related job is bringing matters to his attention which he ought to consider significant. What I have never understood is why this is not self evident to presidents. Why isn't scientific and technological advice in demand along with economic, social and political advice? Whatever the answer to that question, it is surely a fact that except for OSTP there is no one in the White House who can talk with any authority about the technical problems of SDI, the technological competitiveness of American industry or the health risks due to environmental pollution. Absent OSTP it is doubtful whether there are any people who can locate the very best scientific and technological expertise which is available. In contrast, economic and social experience is available in abundance.

This role, which I consider central, does not require a bureaucracy. It can be carried out by a relatively small office. What it does require is a close relationship to the President and his staff, an awareness of the problems which face the President and which are important to him. On the other side it requires links to the broad scientific and technological community and especially to the very best and most able elements of that community. It requires, on the one hand, that the Director and his staff be members of the White House team who carry weight in the give and take of White House and Executive Office discussions. On the other hand, their scientific stature must be such that they are respected in the world of science and technology. Under Presidents Eisenhower, Kennedy and Johnson this stature was greatly increased by a Presidents Science Advisory Committee (PSAC) through which a broad spectrum of contacts were maintained.

I am not sure whether it is feasible or desirable to revive PSAC in its previous form but some mechanism must be found to play this outreach role. OSTP needs antennae which are sensitive to the world of science and technology and channels through which both ideas and criticisms can enter the presidential orbit. Even when PSAC existed much of this function was carried out by panels of scientists and engineers who were chosen for their ability to deal with a particular problem, e.g. space, science, anti-submarine warfare or the world food problem. PSAC itself acted in an oversight role and helped the Director of OST to select topics for study, to find the right people for the panels and to assure the quality of the result.

Many people feel that PSAC ought to be revived. It is argued that its role cannot be fulfilled by a group appointed by the Director of OSTP to advise him. Rather, it is said that to enlist the dedicated services of outstanding people the committee must be appointed by the President and feel directly responsible to him. This subject was debated at length last Saturday at a Symposium conducted by the American Association for the Advancement of Science. As for myself I am not sure. The previous PSAC dealt largely with military, space, technical intelligence, and arms control problems as well as basic research and scientific education. A relatively homogeneous and apolitical group could analyze and debate these matters in depth. Now it would deal as well with problems of energy, of agriculture and economic competitiveness. It would therefore be spread very thin and risk domination in each area by especially knowledgeable individuals. On balance, though, I think a PSAC could do what distinguished consultants cannot do. It could bring some of our best minds to bear on the problems of the Presidency and it could provide a source of both stimulation and balance for the Director of OSTP.

Another quite different function of OSTP is to assist the President in managing the enormous scientific and technical enterprise. This includes the sixty or seventy billion dollars of in-house R&D; it also includes the creation of a climate which will stimulate industry and strengthen universities. In short, this purpose of OSTP is to promote the health of the total technical enterprise, including research, development and industrial innovation. In pursuing this goal, the magnitude of research and development funding is important, of course. What I think is more important is the creation of a climate from which creative and adventurous work can emerge. After all, the central mission of science and technology is to lead the way to a better future for all of us. It is as much a question of how well we do it as how much we do.

This is the role which Congress seems most to have had in mind in enacting the National Science and Technology Policy

Organizations and Priorities Act of 1976. OSTP was to provide strategic guidance for federal programs relating to scientific and technological progress. It was to provide annual reports and five year forecasts to the Congress and the public and it was to work with OMB in an annual review and analysis of R&D budgets. The question one must ask is whether this involvement in the details of annual budget reviews, as opposed to strategic reviews of major programs, is compatible with the first purpose, advice to the President.

This dichotomy was also present in the predecessor agency, OST. We endeavored to carry out both missions and were reasonably successful in doing so. Nonetheless, it was hard for the staff to derive personal satisfaction from inputs to policy making. Major programs evolve slowly and individual contributions are often not recognizable in the outcomes. In contrast, interventions in the conduct of programs or the determination of budgets produce an immediate sense of accomplishment. By a kind of Gresham's Law the short range activities of immediate impact tend to absorb available time and effort, thus detracting from longer range analyses and planning. This problem seems still to be with us.

I see no need to change the legislation on this account. However, I believe that OSTP should be encouraged to focus on large issues that affect our national performance. Some of them, such as the support of basic research, centers to promote research cooperation between industry and universities, or improving the quality of education in science and engineering, can be dealt with by NSF. Others, such as research in biomedical science and the utilization of biomedical science to produce better health care can be dealt with by the National Institutes of Health. But when questions are asked which involve several agencies, questions such as the support of University research by DOD and its relation to that supported by NSF, oversight from the Executive Office is needed.

A final point is that OSTP must be a point of contact between the various government agencies and the White House staff on scientific and technological matters. Even if detailed studies are carried out in the National Academy of Sciences, the Department of Energy or the National Science Foundation, they need to be digested and related to whatever issues concern the White House. This often entails explaining and interpreting the analyses to the non-technical people on the White House staff. At times the submission from Cabinet Agencies may reflect the special interest of the agency and OSTP and its consultants may have to step back and put the matter in perspective.

I am pleased that this committee is reviewing the operations of OSTP. Its interest and support as well as its questions will undoubtedly strengthen the office, particularly when it takes a hard look at itself at the beginning of a new administration in another year.

Mr. **Walgren**. Thank you very much, Dr. Hornig.

Dr. McTague.

Dr. **McTague**. Thank you.

I'm particularly pleased to see Congress taking the time to address an issue that I believe is of real importance, that is, examining whether the White House environment has proper access to the scientific and technical it needs for the better good of the Nation.

The necessity part of this, of course, requires us to take a look at the past and the past performance of OSTP. If you ask for a report card on how OSTP has done, and is doing, I suspect you'd get a fairly wide spectrum of responses, depending upon the time period being addressed and the perspective of the respondent.

Is the individual looking for OSTP and its Director to be a public spear carrier for a particular issue and a particular point of view?

Is the respondent from an agency that might have—or not to have someone as an extra layer of bureaucracy?

The most important perspective, however, is clearly that of the prime customer of OSTP—the President—both directly and through the organizations in the Executive Office of the President. This viewpoint, of course, is the most difficult one to obtain. Regardless of the vantage point, though, I think—I suspect that most, if not all, would express some disappointment with both the present and the historical effectiveness of OSTP.

OSTP is far from unique among Federal organizations, both within the executive branch and outside it in this regard, of course. But I assume that it would be rated significantly below average in performance relative to expectations.

Why is this so?

One contributor is unrealistic and sometimes inappropriate expectation. If OSTP is tackling the right issues, most of them will not be primarily technical in character but truly political in the best sense of the word, involving policy of broad societal import, such as health, national security, or economic competitiveness.

We elect the President and the Congress to make these decisions and to articulate them publicly. It is up to them to assign appropriate weight to the technical input.

In the executive branch, the lion's share of this input comes through the various agencies and departments, almost all of which now have significant in-house technical strength as well as external advisory mechanisms.

Where they need supplementation is in cross agency perspective and long-range national policy vision. OSTP's role, then, is to insure that the technical input to the President, both directly and through the Domestic Policy Council, the Economic Policy Council, the National Security Council, the Office of Management and Budget, and other offices, is complete and fair. Its job is not to see that the final decision is the one that the technical community would prefer.

In order to fulfill this role, the Director of OSTP requires easy access to the President and a good working relationship with the various councils and offices. Cabinet rank might help; but, in my opinion, it is not necessary and, in some circumstances, might even be detrimental.

The essential elements are that the Director have the President's trust, that he or she have broad knowledge of science and technology and their societal context, that he or she have access to appropriate information sources, and that he or she understand the political environment and be able to function in it.

Unfortunately, none of these elements can be effectuated by formula or legislation.

Can OSTP play a more effective role in articulating and elevating these policy issues? I believe it can.

First, the Director, whoever he or she may be, must adapt to the style of those in the White House environment. He must earn their trust as a useful contributor and not a special pleader.

Second, he must have easy access to the intellectual resources necessary for the task. If OSTP is to effectively formulate science and technology-based advice in such major issues as economic competitiveness, space policy, national security, international technology interactions—as articulated by Dr. Graham—health, and education, simply must be able to utilize the best technical minds from government, industry, and academe.

It does have some of this access at present. For instance, the White House Science Council is a truly remarkable group of individuals with deep understanding of science and technology and their roles in government, industry, and academe. Their advice, both individual and collective, and their studies have been extremely useful.

The Office also benefits from having on its staff career employees detailed from many agencies and departments, who bring knowledge of how the system works. There are also a few Fellows from industrial and technical societies, such as the Industrial Research Institute and the Society of Automotive Engineers, who provide a useful perspective.

But, in my opinion, these resources are far from adequate both in depth and breadth. It is instructive to compare OSTP's staff with that of the Council of Economic Advisers. Year in and year out, CEA attracts some of the best young academic minds to spend a few years in the EOB, providing first rate economic analysis and policy recommendations.

OSTP, on the other hand, has not adequately tapped this academic resource. CEA is able to do this because of the clear relevance of this government experience to the future teaching and research of these economists.

How, then, can OSTP attract excellent academic biologists, chemists, physicists, and medical resarchers?

One way is to fully utilize the four authorized Associate Director positions. Indeed, the three senior academics that I am aware of as having served in OSTP since its founding had such positions. But at no time have more than two of these positions been filled. And, at present, there are no scientists or engineers with an academic background in OSTP, to my knowledge. With the exception of the Fellows, there has also been an unfortunate lack of industrial experience in the Office.

Some advocate a return to the "good old days" of PSAC to get this involvement. I am pleased to state that I am too young to vouch for whether the "old days" were indeed better in the sense of providing more useful input to the President or whether they just seem better because of the different nature of the times.

In my own opinion, the White House Science Council does provide the required part-time advice, with the advantage of operating inside the system as opposed to being a public forum.

What is needed, rather, is high quality, full time, broadly experienced staff to formulate policy options for the future, as well as a cadre of bright, young scientists and engineers who are still too naive to realize what can't be done. Perhaps a fellowship program could attract such individuals.

The scope of OSTP's charter is very broad indeed, but it is also quite delicate in character. The OSTP Director is not a science and technology czar, nor should he be. His role is to advise, to formulate policy options, to coordinate where necessary, and to assist in the budget process. The Director has almost no line authority. Rather, he must earn trust and moral authority.

While there is no simple prescription for doing this, it is clear that without sufficient staff backup it is not possible for him to address all of these areas in even a minimal fashion, regardless of his personal capability. And, in the increasingly science and technology driven global environment which is evolving, the need for these functions is becoming greater, not less.

I would like to reiterate Dr. David's concluding remarks. The Director of OSTP in the next administration simply must be given the financial resources which will enable him to assemble a team of quality, breadth, and size to effectively address all these issues.

A staff of about 60 full-time equivalents would be required, in my opinion. Needless to say, these positions should be fully funded from the congressionally appropriated budget. The OSTP Director should not be forced into a position of begging for contributions from the various departments and agencies. And, imaginative schemes need to be implemented to entice the necessary talent, both temporary and permanent.

Thank you, Mr. Chairman.

[The prepared statement of Dr. McTague follows:]

Written Statement
of
John P. McTague
to the

U.S. House of Representatives Committee on Science, Space, and Technology
Subcommittee on Science, Research and Technology

Hearing on Oversight of the Office of Science and Technology Policy

February 17, 1988

This is, indeed, a highly appropriate time for a fundamental oversight of the mission and function of the Office of Science and Technology Policy, created in 1976 by P. L. 94-282. Of necessity, part of the process includes retrospection. How has OSTP performed? Has it tackled the right issues? Has it addressed them fairly and thoroughly? Has it provided value added in coordinating technological efforts across agencies and departments? Has its information and advice been useful and significant?

I assume that the answers you would receive to these questions would vary markedly, according to the time period being addressed and the perspective of the respondent. Is the respondent looking for OSTP and its Director to be a public spear carrier for a particular issue and particular point of view? Is the respondent from an agency which would have preferred not to have another looking over its shoulder?

The most important perspective, however, is clearly that of the prime "customer" of OSTP, the President, both directly and through the organizations in the Executive Office of the President. This viewpoint is, of course, the most elusive one to speculate about, let alone directly receive.

Regardless of their vantage point, however, I suspect that most if not all would express some disappointment with both the present and the historical effectiveness of OSTP. OSTP is far from unique among Federal organizations both within the Executive branch and outside it in this regard, but I assume it would be rated significantly below average in performance relative to expectations.

Why is this so? One contributor is unrealistic and sometimes inappropriate expectation. If OSTP is tackling the right issues, most of them will not be primarily technical in character but truly political in the best sense of the word, involving policy of broad societal import, such as health, national security, or economic competitiveness. We elect the President and the Congress to make these political decisions and articulate them publicly, and it is up to them to assign appropriate weight to the technical input. In the Executive branch, the lion's share of this input comes through the various agencies and Departments, almost all of which now have significant in-house technical strength as well as extensive external advisory mechanisms. Where they need supplementation is in cross agency perspective and long range national policy vision. OSTP's role then is to ensure that the technical input to the President, both directly and through the Domestic Policy Council, the Economic Policy Council, the National Security Council, the Office of Management and Budget, and other offices, is complete and fair. Its job is not to see that the final decision is the one that the technical community would prefer.

In order to fulfill this role the Director of OSTP requires easy access to the President and a good working relationship with the various Councils and Offices. Cabinet rank might help, but in my opinion it is not necessary and, in some circumstances, might even be detrimental. The essential elements are that the Director have the President's trust, that he or she have broad knowledge of science and technology and their societal context, that he or she have access to appropriate information sources, and that he or she understand the political environment and be able to function in it.

Unfortunately, none of these elements can be effectuated by formula or legislation. Rare indeed is the technically knowledgeable individual who has been sufficiently involved in the political process to be known by a President or a presidential candidate, much less deeply trusted by him or her. It is probably equally rare to find high ranking national policy formulators in either the Executive or Legislative branch who treat science and technology as a major policy element rather than a minor tool to be utilized as required.

Can OSTP play a more effective role in articulating and elevating these policy elements? I believe it can. First, the Director, whoever he or she may be, must adapt to the style of those in the White House environment. He must earn their trust as a useful contributor and not a special pleader. Second, he must have easy access to the intellectual resources necessary for the task. If OSTP is to effectively formulate science and technology-based advice on such major issues as economic competitiveness, space policy, national security, international technology interactions, health, and education, it simply must be able to utilize the best technical minds from government, industry, and academe. It does have some of this access at present. For instance, the White House Science Council is a truly remarkable group of individuals with deep understanding of science and technology and their roles in government, industry, and academe. Their advice, both individual and collective, and their studies have been extremely useful. The Office also benefits from having on its staff career employees detailed from many Departments and Agencies, who bring knowledge of how the system works. There are also a few Fellows from industrial and technical societies, such as the Industrial Research Institute and the Society of Automotive Engineers, who provide a useful perspective.

But, in my opinion, these resources are far from adequate both in depth and breadth. It is instructive to compare OSTP's staff with that of the Council of Economic Advisers. Year in and year out, CEA attracts some of the best young academic minds to spend a few years in the EOB, providing first rate economic analysis and policy recommendations. OSTP, on the other hand, has not adequately tapped this resource. CEA is able to do this because of the clear relevance of this government experience to the future teaching and research of these economists. How, then, can OSTP attract excellent academic biologists, chemists, physicists, and medical researchers? One way is to fully utilize the four authorized Associate Director positions. Indeed, the three senior academics that I am aware of having served in OSTP since its founding had such positions. But at no time have more than two of these positions been filled. And, at present, there are no scientists or engineers with an academic background in OSTP, to my knowledge. With the exception of the Fellows, there has also been an unfortunate lack of industrial experience in the Office.

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The Director of OSTP in the next administration simply must be given the financial resources which will enable him to assemble a team of quality, breadth, and size to effectively address all these issues. A staff of about sixty full time equivalents would be required, in my opinion. Needless to say, these positions should be fully funded in the Congressionally appropriated budget. The OSTP Director should not be forced into the position of begging for contributions from the various Departments and agencies. And, imaginative schemes need to be implemented to entice the necessary talent, both temporary and permanent.

Biography of
John P. McTague

John P. McTague is Vice President - Research, Ford Motor Company. Prior to joining Ford in 1986, Dr. McTague spent two and a half years as Deputy Director and then Acting Director of the Office of Science and Technology Policy, Executive Office of the President.

He received his undergraduate education at Georgetown University, followed by a doctorate in Physical Chemistry from Brown University. From 1964 to 1970 he was on the technical staff of the North American Rockwell Science Center. He then served on the Chemistry faculty and as a member of the Institute of Geophysics and Planetary Physics at the University of California, Los Angeles. In 1982 he became the first chairman of the National Synchrotron Light Source Department at Brookhaven National Laboratory, and adjunct professor of chemistry at Columbia University.

Mr. **Walgren**. Thank you, Dr. McTague.

Do we have agreement on the importance of substantial staff that is directly funded by the Congress? I think Dr. Hornig indicated that this need not be a large operation, if I'm remembering right. And yet, Dr. Press, in his testimony, asks for 60-some people. Dr. McTague, you make the same point.

Is there agreement on that point that somehow or other we're—we don't have in place a—a legislated structure that should show glaring vacancies when they're vacant?

Dr. **David**. Mr. Chairman, while you were out of the room briefly, I pointed out that during my time as science—as head of the OSTP, or what was OST at that time—I had 50 professionals—including detailees—plus support people, and a budget of $2 million.

Today, the numbers are about half that, or less, and the budget is still around $2 million—a little bit less. And I think that all of us—I might speak for all of us—in saying I think we certainly agree that the activity is vastly undermanned. In fact, I would call the level of manning and the level of activity—they are ludicrously small.

Mr. **Walgren**. [Pointed to Dr. Hornig.]

Dr. **Hornig**. Yes, I've been quoted as saying it can be done with a small staff—a limited number of things can be done with a small staff. But I think to do anything like what is called for in the act and that the general expectations from the Office requires a larger staff than it has.

In the early 19—middle 1960's, the staff was 30 or 35 people at the Ph.D. level, plus supporting staff. And, of course, it's markedly smaller now. We also had then some two or three hundred consultants as opposed to—I think a number like 59 or 60 was mentioned today.

So the general support in the past has been greater, and I think it needs to be now if it is going to do what people seem to expect from it.

Mr. **Walgren**. Dr. McTague?

Dr. **McTague**. [Shaking head in the negative.]

Mr. **Walgren**. There has been mentioned that it's somehow dangerous, or not most effective, for the Director of OSTP to be seen as a special pleader. At the same time, simply being in the position of providing technical advice seems a little passive, given the—the forces that move in any political decision in the best sense of the word.

Is there a—should the Office develop a role of—of coming to a position and then advocating? And can an office, largely staffed by people detailed from mission agencies, be seen as anything but a special pleader, given the short term that people from those agencies could come and—and the directness of their involvement with the agenda, whatever that agenda is?

Dr. **David**. The whole question of how OSTP is tasked—something that is very rarely addressed—and I took the job as Science Adviser, one of the first things I did was to try to put together, with the help of the staff and PSAC and our other panels, a list of issues which were on their minds as being something that the President needed to know about. Then I went around to the NSC, the Domestic Council, the Economic Policy Council, or the corresponding agency then, to various members of the White House staff in the West Wing, and even to the President himself, and reviewed that list and came up with a much shorter list which seemed to center on matters which were of real concern.

And that's what I call an activist role, and I think it's perfectly—perfectly justifiable.

Mr. **Walgren**. Other response?

Dr. **David**. It wouldn't make the Office a special pleader because it would have in effect——

Mr. **Walgren**. But you brought up with issues, but then you didn't develop an advocacy position on those issues; is that——

Dr. **David**. No, I—I wrote a short paper after being in the White House office for a while, which was called "Issues or Advocacy Science Advice for the President," which I said I thought the job of the—of the Office was to develop a series of options well thought out, well staffed, which the President could choose between, and not to try to become an advocate for any particular point of view.

Mr. **Walgren**. Dr. Hornig?

Dr. **Hornig**. Yeah, I think I would concur with that. I must say that I felt it obligatory to be an advocate within the circles of the White House, but I think would be entirely wrong for the Office to get independently associated with—with particular points of view. And when I—that I agree, though, that it should not be a pleader, though. And what I mean by being a pleader is being automatically know—I don't know—pro-higher basic research projects, or—or any positions that seem to go with being allied with an external constituency. I think that would weaken the Office.

I think the important point is that it ought to be a—a major participant in the internal discussions of the White House and the Executive Office, and ought to bring to bear there the special kinds of arguments and considerations about which it knows more than other people.

Mr. **Walgren**. Dr. McTague?

Dr. **McTague**. I think there's a delicate balance in using the words "advocacy" and "special pleader." And in being an information source, there's no such thing as neutral information. The way one presents information that there implies some preference for how it's to be used.

It seems to me that when the Director has, because of the scientific or technical input available to him, a—a particular point of view on an issue, he should advocate it internally as effectively and as fairly as possible. That doesn't mean trying to force the issue—it's one piece of information usually to very complex decision processes.

On the other hand, it certainly—as—because of the close relationship of the Director with the—with the President, it—it's certainly his role to publicly and otherwise back decisions that the President has made.

Dr. **David**. I'd just say I think that's correct. It's fine to advocate a particular point of view within the White House circle. I think to advocate it on the New York Times front page is a mistake. If you look back at the history of PSAC and when it was abolished, it was basically abolished for two reasons: One, the people in the White House, including the President, I believe, saw the office as being an advocate for the academic community and for the funding of basic research primarily; and, secondly, there were people on PSAC that were looked upon as in the "we/they" syndrome, as "they" and not "we". And there were a number of advocates in the arguments about the SST and the ABM at that time which were—which did hit the front pages of the New York Times and The Washington Post. And this is a posture which is, I think, quite unacceptable in a political situation such as the White House inevitably is.

Mr. **Walgren**. Mr. Brown?

Mr. **Brown**. May I say first that I find it tremendously helpful to have this distinguished group of former science advisers reflect on the position and how it could be made more effective. Obviously, there are a number of intangibles here which some of you—maybe all of you—point out are difficult to deal with legislatively.

But I get a—I think a common theme that we do need to focus the—the role of the Science Adviser and the Office somewhat more on the policy issues, and if I—if we can describe them that way as the strategic policy issues, which indicates a somewhat longer perspective, although not to the neglect of immediate critical policy issues which are generally a component part of the longer range issues anyway.

Am I correct in feeling that this is the situation?

And possibly in looking at the act, we would be well advised not to try and force more detail on this Office, but to focus on ways in which we could strengthen that role and perhaps even take away some of the minor, say, budgetary reviews, or statistical analysis, or reporting functions that are now a fairly substantial part of the act.

Am I again interpreting it correctly in this?

Dr. **David**. As far as I'm concerned, yes.

Dr. **Hornig**. I think so.

Dr. **McTague**. I'd like to make a few comments about that.

One, I absolutely agree that the most important role for the Office is to address strategic policy issues. And the most important thing for it to do with those issues is to operate within the White House environment so that it effectively serves the President in raising these issues to the level that they should be raised.

I contrast that output with an output that might be in the form of a published report.

On the other hand, there are some day-to-day routine things that I think the—that the Office must do by default, one of which is following the Federal R&D budget. Good cooperation with OMB, I think is necessary for the national good to be done in this area, and that involves closely cooperating internally and informally with OMB and with the agencies in budget development.

Equally importanty, close cooperation and follow-on with Congress as Congress deliberates on—on what it wishes to appropriate.

Mr. **Brown**. Well, even here it—while I agree with you that there should be this close cooperation, the details of that to a great extent can be—and to some extent are being done by OMB—they do the statistical analysis of the R&D budget. I don't think they give it quite the same evaluative or normative kind of a—of an analysis it probably should have from, we'll say, the Science Adviser.

But, again, that would have to be done through close cooperation.

This leads me to—to the further comment: several of the witnesses had suggested a higher status for the—for the Science Adviser. I'm led to contemplate just what it is that distinguishes a status, we'll say, a Cabinet level status from the current status.

Generally speaking, it seems to be the practice of most Presidents to select key Cabinet members, and frequently all Cabinet members with a—with a strong bias toward their political compatibility. And that there is a close political working relationship between the Cabinet members and the President in most cases.

And that one of the possible considerations in changing the status is not so much the level as it is creating that close political compatibility, and conceivably the cabinet status, with or without the portfolio, might contribute to that.

I'm reminded even more—and I'm going to throw this out just because it was going through my mind in—in connection with your testimony and it may be totally irrelevant—but we have a very large intelligence community with a budget that is a substantial fraction of the total R&D budget of this country, and the President has a trusted adviser who, for most of his term was Bill Casey, who headed up that operation; not that he headed the individual segments of the intelligence community, although he was head of the CIA, but his function was adviser to the President on intelligence. And he had a small staff distinct from the CIA for that purpose—the intelligence community staff.

I'm wondering if there might not be a parallel there in the sense that our science and technology efforts are in some ways comparable to intelligence gathering and intelligence analysis. I don't want to draw the parallel too closely, but there are elements of similarity. And, of course, the distinction between the role that Bill Casey played and the role that most Science Advisers play is quite marked. There are other reasons for that, of course.

But it would seem to me that if we had a Science Adviser who had the confidence of the President that the intelligence adviser has that we would have a much more effective operation in the White House.

Would any of you—does that stimulate any thinking or comments on——

Dr. David. Mr. Brown, you've got a great deal of background in all of this, and I really appreciate your comments. I think they provide a platform for talking about this on a very elevated and sophisticated level.

Let me point out something that you already know. Dr. Stever—Dr. Guy Stever—in effect was such a person. In his role as Science Adviser, he was also head of NSF where he was a Science Adviser to the President. So there's an analogy there—the CIA and the DCI.

My personal opinion is that intelligence setup doesn't work very well because the DCI, if he's head of the CIA, is looked upon by other elements of the intelligence community as being biased toward his own agency.

Now, I think the same thing would happen if you had the Science Adviser as the head of NSF, or the DDR&E, for example. So I would want to keep those things separate.

I would like to see a very professional and adequate size staff either as part of a special FCRC to the White House or as a part of OSTP.

Mr. **Brown**. Well, I appreciated that proposal that you made with regard to a Federal Contract Research Center. But we have a number of those in operations, and they have provided very valuable assistance within their field of their charter, like the Rand Corp.

General Abramson has asked for such a facility for just for the SDI.

It certainly seems to me that something similar to that would be appropriate for the general field of science and technology as a resource of the Office of the President. It is a new idea, at least in that context, and I think it's one well worth examining in more detail.

Dr. **David**. I would like to say one thing about the Cabinet status. I also suggested that as did other people here.

I don't think that the political credentials for a seat at the table, if you will, in Cabinet meetings would be anymore stringent than the current science advisory requirements on political affiliation.

The real point is the one that you made, that the President has to be comfortable, has to be able to understand what the Science Adviser says, and has to trust him.

Mr. **Brown**. Well, I'm afraid that is the bottom line, actually. I don't think we've had many recent Presidents who had an understanding of the vital importance of science and technology policy, both to the national welfare, and being in the domestic welfare in the sense of health, industrial competitiveness, environment and that sort of thing—plus its impact on national security as well. Because fundamentally, our security resides in our ability to maintain some leadership role in high technology areas. And this is the thing that disturbs me very much about what's happened in the last few years—just like it disturbs Mr. Gorbachev.

Dr. **Hornig**. If I may say just one further——

Mr. **Brown**. For the Soviet Union. He doesn't mind our decline. [Laughter.]

Mr. **Walgren**. Dr. Hornig.

Dr. **Hornig**. If I may just comment, it seems to me that when people propose either Cabinet status or anything like it, what they're really talking about is to just the question of stature, primarily. They're concerned that the Office doesn't seem to have made it with the President. In one sense they're worried that it will drift off into being a source of reports and documents and analysis and not paid attention to when they—someone looks for formal remedies.

It is true that at times in the past the directors routinely sat in on Cabinet—has sat in on Cabinet meetings, and routinely sat in on a large number of Security Council meetings.

I think that is a good thing, but I don't see how you can legislate it. I think it's good because that's part of actually participating in what the issue is—in facing the big issues around.

Mr. **Brown**. Well, I'm inclined to feel that perhaps we have tried to constrain the President too much. And what we should do is give him options rather than giving constraints.

Dr. Hornig. Right.

Dr. David. Although I think it is worth noting, Mr. Brown, something that you know already—I did the same thing that Don Hornig did—I sat in on many national security meetings and Cabinet meetings, always in the back row. [Laughter.]

Dr. McTague. I don't know what the present situation is in the Office, but during my brief tenure there there was never a forum that I thought I should have access to that I did not have access to—and I didn't sit in the back row. [Laughter.]

Mr. Walgren. The gentleman's time is expired.

Mr. Nagle.

Mr. Nagle. Let me pick up on that if I can. I've had the opportunity to review all your testimony. By the way, I think it's excellent. It's valuable for us to have a few men with the experience that you've had here for us.

Dr. Hornig, I think you said it best; you said there is little external evidence that the current President and his staff seek to involve OSTP. In that case, I'm not sure what can be done to make OSTP effective, no matter what the qualities of the Director.

I think my colleague from California, Congressman Brown has also pointed out, as you have, that a lot of it has simply to go with the relationship between the President and the Director.

I had the opportunity to spend the last 4 years of close-up time with every person who sought the Democratic Presidential nomination. And without casting dispersion on any of them, I think if you sat down and said to them today, what is going to be the role of your Science Adviser? And all candidates say, my what? [Laughter.]

And, secondly, they'd say, you mean I have one?

Which raises the question, if there's nothing that can be done to enhance this administration's use of a science adviser, is there anything we can do—recognizing that a new President is coming in—to prepare that President better for the utilization of his Science Adviser?

The transition period is roughly November to January. As my colleague has pointed out, you have to appoint a Secretary of Defense, a Secretary of Commerce, Secretary of Energy. After about 6 months there you get around to the Science Adviser.

Why do we have to wait until November to begin to formulate for whoever takes that office and elevate the priority of that science adviser? Why do we have to wait until November? Why can't we start in June? Why can't we start in July? And what mechanism would we use to do that so that when that person does take that office, we had some idea of what that person is and what its function is, and his value?

Dr. David. My personal opinion is that a candidate—Republican and Democratic—should be asked in a very prominent forum, who do you know in the scientific or engineering community that you've talked to in the past 6 months.

Mr. Nagle. Dr. David, we tried that—in Iowa, and in New Hampshire. We invited all those Republican candidates to New Hampshire. We invited all the Democratic candidates to just talk about their space——

I understand their problems, but not one—from either side—came to the hearing, or sent a statement. And that——

I'm wondering if you can't work in terms of the transition if there's an opportunity there in transition to educate the man.

Dr. DAVID. As you say, the transition is so short and so chaotic that it's a very, very difficult problem. And if you read the literature on the Presidential transition since it's been shortened to 11 weeks—is it—or 14 weeks?—something of that order.

Mr. NAGLE. They don't talk to me after the revival, sir—I have no idea. [Laughter.]

Dr. DAVID. Almost all of them have a pre-inauguration task force on science and technology, on the National Science Foundation, the H2S, NIH, et cetera, and they do get some input from those pre-inauguration task forces.

But you're right, it is not in the front of their minds because they have other fish to fry. I don't know what the answer to it is, but it's certainly an important problem to focus on.

Mr. NAGLE. Well, if we started with that—looking at that transition, at the scientific community itself—started looking at that position, say, in July, rather than waiting until the election—and it was an independent, nonpartisan, bipartisan evaluation, to make specific recommendations to the President's transition team, and those recommendations were ready to go when the President was elected—when that President—when that transition team——

I'm just looking for a way to, you know, get the focus——

Dr. DAVID. I wish Frank Press were here, because Frank—the National Academy of Sciences is trying to do exactly this. I am a member of one of the panels, and they are trying to put together some statements which will be helpful to the new President. Whether that's adequate or not, I don't know.

Mr. NAGLE. Dr. Hornig?

Dr. HORNIG. Well, I find it hard to believe that it will be effective to, in a sense, choose the man in a neutral forum and still meet Mr. Brown's objective of having him be someone who is trusted—and then relied upon by the President of either party after the election.

Mr. NAGLE. I would give you that—but stop short of picking the man, simply listing what the requirements, functions, opportunities are, and what steps need to be specifically taken to insure that whoever the man the President chooses is effective.

Dr. HORNIG. Yeah, and it seems to me that in our most successful transitions in the past, the President, in some cases, has been identified with a man and a couple of salient problems which were important at the time of the election, you know, whether it be the missile gap, or whatever. And the rule has—the route has been that the adviser came sort of along with the President.

Dr. MCTAGUE. It seems to me that part of the issue here is a failure of the technical community itself. It's part of my written statement that I didn't read, which reads as follows:

> "Rare indeed is the technically knowledgeable individual who has been sufficiently involved in the political process to be known by a President or a Presidential candidate, much less deeply trusted by him or her. It is probably equally rare to find high ranking national policy formulators in either the Executive or Legislative

branch who treat science and technology as a major policy element rather than a minor tool to be utilized as required.

The long-term solution to this problem involves the technical community becoming more involved in the political process, in my opinion, from which they are woefully absent at present except when they wish to appear as the special pleader; and, then it's too late.

Mr. NAGLE. Thank you.

Thank you, Mr. Chairman.

Mr. WALGREN. Thank you, Mr. Nagle.

Miss Schneider.

Miss SCHNEIDER. I have so much to say I don't think we can even fit it all in this hearing.

I'd just like to comment on your one remark. I think that every time I have the opportunity to speak to academicians or to industry representatives who are responsible for research and development, I always point out that the same fact that you did, is that there's such an attitude toward crisis management—and there is little knowledge of how to be an advocate for your own research projects, and that is why we see some of the larger projects and the bigger science proposals getting momentum and support to the detriment of many of the smaller—Superconductor Super Collider obviously being one of those items.

But, Doctor, I'd like to ask you specifically—you were in the—you were Science Adviser in 1985 when the Appropriations Committee significantly cut back the budget of your agency.

What do you believe was behind that budget cut, honestly?

Dr. MCTAGUE. As you know, that was a rather chaotic time that occurred. The budget was put together within the week of my taking that office in an acting position. I forget which way—which the sign was, plus or minus.

My perspective on that issue was that the Office, as Dr. Hornig stated—the Office can function with a small size. It does so, though it must choose its issues carefully. It cannot cover the full mandate, which is in the 1976 legislation.

Because that—what was happening was so chaotic at the time, I don't know what the fundamental character was or the—the reason for the cut in the budget.

Miss SCHNEIDER. Well, some have said that it may have occurred because of the committee's disagreement with the President's scientific strategies, and that was a way to—to make the point.

Do you believe that that argument holds some weight?

Dr. MCTAGUE. My guess is that there was—that there was not such deep thought put into the matter. [Laughter.]

Miss SCHNEIDER. We won't let any of the Appropriations members be aware of your impression.

Dr. Hornig, I wonder if you could share with me your observations from your current position at the Harvard School of Public Health.

In the area of health care and health sciences, what do you perceive as the accomplishments of OSTP, or the goals?

Dr. HORNIG. I'm afraid I'm going to ask that—answer that by saying I have had no contact with OSTP.

Miss SCHNEIDER. Well, do any of you gentlemen who are testifying this morning have any awareness at all of what OSTP may have been doing in that area?

Dr. HORNIG. Yes, I can, I—now that I think a little bit about it—they, for instance—I'd—put together a uniform set of guidelines for cancer risk assessment. Various agencies, EPA, FDA, all had different approaches to that problem of assessing the risk from individual chemicals. And a rather good job of bringing people together and trying to gather the report which would bring a coherent and uniform policy.

Miss SCHNEIDER. Thank you.

It seems to me that there is some agreement among all of us here that given the limited budget and given the scope of opportunities for involvement that, needless to say, the most significant contribution that OSTP can have is through narrowing its scope of goals, and setting realistic expectations.

I think, Dr. David, you had said at the beginning that the expectations were too great. And then, Dr. McTague, you had said that you would grade OSTP's performance as below average.

I don't think that we could look ahead in anticipating any kind of great boons to the—to the budget of OSTP, given the deficit and the challenges that we're dealing with—unless some of those moneys were redirected from the 73 percent margin that is currently being spent on defense.

There are some members of this committee—they're anxious to make happen a greater balance between the commercial and the defense sector, recognizing that the pie is a fixed pie and there are so many dollars that can be utilized.

Would you three gentlemen support a shift from our investments in defense, which right now is 73 percent of the Federal research dollar goes toward defense? Would the three of you gentlemen support a shift into the commercial areas of research?

Dr. DAVID. Commercial areas?

Miss SCHNEIDER. Into the—not necessarily commercial, but let us say non-defense sector.

Dr. McTague.

[No response.]

Miss SCHNEIDER. Yes, Dr. Hornig.

Dr. HORNIG. I don't think that question can properly be answered by saying which sector should the money be spent. It's too many apples and oranges. There is no such thing as the research pie, which I think we can meaningfully divide up.

Most of that defense budget is devoted to weapons development—not to research at all. What I'd mostly call research isn't that overwhelming. And in the end, the amount that is spent on research is so much less than the amount eventually spent on production and on the—either in the civilian side, I mean, actually using things—on the defense side, in maintaining the weapons system.

But I think the real question is, Can the research on either side be more effectively spent? Can we identify things that are—are not being done that ought to be done. And if that is so, it's then an open question to me whether the money to do so should come from other kinds of activities than research at all, or from other research activities.

Miss SCHNEIDER. Well, you see, Dr. Hornig, our challenge is always to have to play with apples and oranges and bananas and everything else, because we're looking at the whole budget deficit overall. And our challenge is if we are going to spend more money in one area, we have to take it from another. Over the last 6 years we have been taking money, or at least reducing the amount of spending, in a number of areas: human service, health, and some of those areas. We have been increasing the defense column, whether they be development or production, or what—or whatever it might be.

So we have to look everywhere and every under rock—under every rock that we can to find some—some moneys.

Dr. DAVID. If I might just comment briefly on it—on the amount of money that the Defense Department spends on fundamental research is the 6.1 expenditure, is less than the NSF budget and much less than the NIH budget.

If you are talking about taking money out of 6.1 to provide something on the civilian side, I think it's a very small pot.

Miss SCHNEIDER. How about taking it out of the development pot?

Dr. DAVID. Well, as Dr. Hornig says, it's apples and oranges—maybe you could do that.

There are two issues: One, can you double the budget of OSTP, for example, and double the staff size?

The answer to that, in my view, is you could do it, and it would be lost in the round off of the Federal budget. I don't think that that ought to be a serious matter for discussion. I think doubling the OSTP budget is something that could be easily done within the financial wherewithal that the government has.

Mr. WALGREN. The gentlelady's time is expired.

Let me recognize Mr. MacKay for a quick follow-on and then you'll have a—amount out of your time in a second.

Mr. MACKAY. I appreciate what you gentlemen are saying about apples and oranges, and it's difficult to make that kind of decision.

I guess Congresswoman Schneider and I worry that it seems to have come out of the apples, which were civilian R&D, to go into the oranges, which were military. Nobody said anything. I'm surprised. And I think we're paying a price for that now.

Miss SCHNEIDER. Exactly.

Mr. MACKAY. We're asking the question: If there's not enough money to do everything, is there some mechanism, and could OSTP be that mechanism, to help Congress understand what the priorities are if we've got to cut some? I guess that's what I understood to be the implication, and I'd——

Dr. DAVID. I think, Mr. MacKay, the Office, within the past couple of years, has made a number of attempts to say something about that. And in fact, Dr. Graham said something about it here this morning, namely, that the Federal Government will not be very good at trying to bolster the economic competitiveness of the private sector except through indirect actions such as help to education, such as encouraging the States to take steps to set up centers—which involve both industry and the universities, and providing some funds for that.

So that there are indirect ways for going about it, but I don't think these are very big programs. They don't in any way match the kind of expenditures the Defense Department has put into weapons systems.

Mr. MacKay. But the growth in those programs stopped and, in fact, was reversed when the defense buildup started—that's the point. There was a trade-off.

Dr. David. Well, there was a trade-off in some areas, for example, in some of the energy research. The judgment there was made that the things that were going on in energy research could not be commercialized given the drop in oil prices and fuel prices. So that that research should be scaled back.

I, as a former oil executive, support that.

Mr. MacKay. I don't—I don't object to that.

I'm talking about the leveling off in effect—reduction in real dollars of NIH research and NSF research, not last year but over the past 5 years.

Dr. David. Well, I would like to look at the—at the numbers. My impression—and you can correct me if I'm wrong—is that both the NIH budget and the NSF budget has risen substantially in the last 5 years.

Don, is that——

Dr. Hornig. Well, I haven't looked at it in detail but that's my impression too of—in fact, both risen.

Mr. MacKay. You're satisfied that——

Mr. Hornig. The way I would go after—if I were in the position to answer that question, what I would want to know is not the question of transfer dollars. I'd ask myself should the whole defense budget come down? I guess I would feel that one's likely to find an answer there that will save more money than on the research part.

But forgetting that, then the question is, is the development program, which is a big one—and that one would have to be looked at detail—in detail—appropriate to support the military program we want. I mean, if we want a B1 bomber, we have to do the development to have one. If we want an MX missile, we have to do the development on an MX. And it's—so it's—I think I would come to that budget by that route, and that takes an examination, of course—I haven't done. I think that's why I don't have it here.

Dr. David. Your question, should OSTP have a role in setting priorities—I think the answer to that is clearly yes—absolutely. They should be advising you, and they should be advising the President as to what they think the priorities are for spending.

Mr. MacKay. Thank you.

Mr. Walgren. I thank the gentleman.

Mr. Price.

Mr. Price. Thank you, Mr. Chairman.

Mr. Hornig, you stress in your statement the importance of OSTP focusing on large issues that affect our national performance. And among the issues you mention are the support for basic research, promoting cooperation between industry and the universities, and improving the quality of science and math education.

I have another candidate for that list based on some hearings which this subcommittee held earlier this year—one of those hearings being in—in my district in the research triangle area of North Carolina—and that is the quality of the workplace of tomorrow, especially the high-tech workplace, and the kind of things we're going to have to do to educate and train our people to take their place in—in that workplace. Probably, of course, that's a question of—of basic literacy training. But I think what we've come to realize—that literacy is a moving target. We are no longer talking about the three R's in many of our industries. We are talking about basic science and math education, in some cases. We're talking about an ability to reason, to analyze, to follow complex instructions.

I wonder as we look at our needs in science and math education, as we look at the high-tech workplace, if there is in your experience any useful role that OSTP might play in focusing on the policy implications of—of these developments?

I'd welcome comments from any of you as to what the track record OSTP is in this area, and what you think the proper role might be.

Dr. HORNIG. It's certainly an important area; not only important—I think the future of the country—the state of our education at all levels and—and scientific literacy, if you like, is critical.

As to what OSTP can do—it has at various times had sponsored committees and panels to look at this problem, and made suggestions. It got much involved when it was OST in the question of the new physics curriculum, as a matter of fact. None of these, I must say, solved our problems.

I don't think this small office can turn a problem like that around. What it can do is to take a hard look at what's going on in NSF and other agencies, and in the Department of Education, and stimulate activities. It can put together studies. It can be a nudger and a catalyst. But it's too small a part, I think, to make a big dent on the problem alone.

Mr. PRICE. Well, I—just to follow up on that before we turn to the other panelists. You talk about focusing on large issues. It's not entirely clear from your statement exactly what you have in mind in terms of the specific role OSTP might assume. Maybe this is the place to elaborate on that.

Dr. HORNIG. Well, I think it's selecting issues, you know, which are either are or about to be critical to the country, and which can't be dealt with in other places in the government, which are important to the President —and then doing what seems most appropriate.

I know that isn't a good answer to your question, but I think those are large issues at one time, and I think arms control issues, to me, are large issues to which OSTP at times has made important contributions.

I think all of these questions now of what—what kind of a Federal role can there be with respect to civilian technology. I'm intrigued there by the fact that there's a national debate which on the one hand admires the Japanese way of doing things when it is doing all the things that my colleagues here have said would be terrible for us to do. And you know, we can't have it both ways. Evolving—evolving a national appreciation of what—what we might want to adapt from the Japanese and what we don't is a very important issue that could be dealt with by OSTP, for example.

Dr. DAVID. On a slightly different slant on this question—I think OSTP can play a larger role in this whole educational question. You recall in my testimony I said there were two principal issues: economic competitiveness on the international scale and education.

It is fashionable, and has been fashionable many years, to say that technology should provide us with better education in—in the schools and in the universities and colleges.

I believe that we're getting to the point where that can be realized to a larger extent than it has been before. And let me just give two examples. IBM—and I'm not retained by IBM, nor am I a member of IBM—is developing some software at one of its facilities which is intended, and indeed under test has shown, can bring the level of teaching in mathematics from what was considered a mediocre level to a very high and acceptable level, and improve the mathematical capabilities of our students by a major factor. And—it's software which can be used on almost any personal computer.

I think that more of that is going to come in more areas.

The second thing—and I hate that all of this is mathematics. Hewlett-Packard—and I'm not retained by them either—has put on the market a calculator called the 28C, which is not a numerical calculator, the numbers don't—you don't have numbers on the scale; you have symbols—you know, A's, B's, and C's. And that calculator does algebra. And when you ask yourself, what is that going to do to the teaching of algebra in the schools? Or how can it be used to improve the teaching of algebra in the schools? You suddenly come across a whole library of ideas, which are very exciting.

I think OST could, first of all, explore what these tools are and how applicable they may be; call the attention of the school boards and the local people to this kind of activity and improve the teaching in both schools and universities by a major factor. And I think that's something OST should chase.

Unfortunately, as I said in my testimony, I don't think they have the wherewithal to do that at the present time. They just don't have the people. And so I would encourage you very much to augment their capabilities.

Mr. PRICE. Just a quick footnote on IBM. Chairman Walgren and I did hear from the general manager of IBM in North Carolina. He talked some to some extent about this software they are developing for literacy training and also for assisting in science and math education.

He also testified about what they were going to be requiring of their own work force in the next decade. Now, there'd be no place in that work force for anyone without at least 2 years beyond high school, and the kind of upgraded skills they were going to be needing, very effectively underscored the problem.

He's already done something about the problem, as a matter of fact—has a very impressive cooperative relationship with the community college system there in bringing workers along in their skills. But it certainly helped us focus on the problem.

Dr. McTague.

Dr. MCTAGUE. I must say I agree heartily with what Dr. David has been saying, that there are these very major areas that should be worked on by OSTP. In particular, OSTP, if it had the proper size staff, could do a better job of stimulating the Department of Education. With a staff that it presently has of, what, less than 20 or so—20-ish—full time equivalents—I don't see how it can possibly do that. That's one person for every $3 billion of R&D that this government does. And if we can't get money to double that, I don't know—I don't understand the cost effectiveness.

Mr. PRICE. Thank you.

Thank you, Mr. Chairman.

Mr. WALGREN. Thank you, Mr. Price.

Mr. Skaggs.

Mr. SKAGGS. Thank you, Mr. Chairman.

I couldn't help but think I wondered how the Secretary of Education would respond to the idea of being stimulated. [Laughter.]

I apologize for having arrived after your presentations and I'm not sure this has already been addressed. If it has, I'll yield. But I'm interested in your general observations about the Sematech model and either the promise or the pitfalls that inhere in that as a way for us, as I believe Dr. David was mentioning, either following or avoiding the Japanese model.

Dr. DAVID. Mr. Skaggs, I chaired a panel for OSTP—actually for the White House Science Council—on the whole question of the semiconductor industry. I think this is well known because it was announced. The report, I understand, will be made available relatively shortly.

But out of that comes a number of interesting things. One is that the Japanese are moving their modes of research and development toward the American model, and the Americans are moving their research and development model toward the Japanese. So presumably they will meet in the middle somewhere and maybe both will be more effective as a result.

But I think the general question of consortia—industrial consortia—the general question of centers for research, and what I call the collective mode for research and development, is a very real question as to whether we're going down that road too fast and what the result is likely to be. We do need careful examination of that activity to look back at what's been done in the past and what the effects have been to recommend and to put in place certain constraints or safeguards if those are appropriate, so that we don't end up with a large number of bureaucratic organizations—either industrial or university—which will be very difficult to get rid of, even though they've become quite ineffective.

I think that there's some very real questions that need to be examined.

Mr. SKAGGS. Either of the other gentlemen care to comment on that?

Dr. MCTAGUE. Yes, I think the Sematech case is a rather special case. This is something I've done a lot of thinking about, naturally—I worked on the predecessor of Sematech when I was in Washington. The government has historically been a very poor driver of industrial technology. It doesn't know how to pick winners—nobody knows how to pick winners. But the statistics of the marketplace seems to winnow out the losers and allow the winners to take over. So from that point of view, Sematech doesn't appear to be a very wise idea.

On the other hand, the Department of Defense has a very specific need for the technologies—for the most advanced microelectronic technologies. It has historically invested in R&D in this area for its own use, and effectively so. It's for its own use that I think is important here. So, here in this particular area we see a natural convergence of industrial needs, industry coming together—organizations that historically have been very leery of each other in a very buccaneering industry have said, we've got to cooperate—and the government having a convergent interest. The Sematech concept, I think, is a very interesting one and one that is important to try.

I don't know if its going to work. But I don't think we can afford not to try it.

Mr. **Skaggs**. Thank you, Mr. Chairman.

Mr. **Walgren**. Thank you, Mr. Skaggs.

Mr. MacKay.

Mr. **MacKay**. I just have one question.

I was intrigued by your comment, Dr. David, about the risk of starting a number of centers and then having them either finish the function for which they were originally set up or else sort of outlive their usefulness because that becomes no longer a priority.

I wonder if—if you would care to comment on whether or not that risk exists with the Federal labs?

Dr. **David**. Well, I——

Mr. **MacKay**. If it does, who should be telling us which ones—in other words, should there not be some coordinating mechanism? It seems to me—this is my editorial and I apologize for it. It seems to me that's a very entrepreneurial activity now. Some of them have finished the role for which they were originally set up, and they are kind of like the March of Dimes—they look around and find another role. If they can get us intrigued enough, we keep putting up the money.

I wonder who should be in the executive branch doing oversight, coordination, and could that money not be directed to better use?

Dr. **David**. It's a big problem, Mr. MacKay, that you are asking about. As you know, Mr. Packard headed the study of the national laboratories for the President, and I believe it was for OSTP. And out of that comes a number of statements such as the fact that most of these laboratories have indeed outlived their original mission and have become, as you say, entrepreneurial or have become job shops—to put it in a less complimentary way.

I do think that you have to look at two or three things here. Number one, are they doing something that's useful to the agencies which are funding them?

In general the quality of the work, is it high enough to compete in the sort of marketplace with other ideas?

I think the picture, if you look at the entire spectrum of national laboratories and Federal laboratories, is extremely mixed. Some of them are not so good; some of them are very good indeed.

I don't know of a mechanism to do some winnowing there. You have the same problem as closing military bases. I think the best thing to say is that the agencies which are footing the budgets for these activities in their total budget really have the responsibility to decide how much money to put in and whether something useful is being done.

But initially, laboratories I think are fine; and, in fact, I think they are the best kind even in industry. But when they outlive their mission, you have a problem.

I do not think OSTP can have a very active role at the level of individual laboratories here.

Mr. **MacKay**. We've had a number of discussions of this. In fact, it has come up almost spontaneously in our Technology Task Force, I believe at every hearing. One witness or another has said, hey, you guys ought to be—I mean they've said it in more—not sawmill language, but they've said it in academically acceptable language: You guys ought to be doing something about this cause nobody's in charge.

Then we have gotten into these very distressing debates about whether we should try to reorganize at this department or that department. And we've—the only consensus seems to be that reorganization is not the answer; that you need a coordinated mechanism at the highest possible level. And when you look at the names of agencies, name, Office of Science and Technology Policy, sort of leads you to believe that that would be a relevant thing for them to do. At least make recommendations to us.

Dr. **David**. Well, I think the OSTP would be put into a rather untenable position. I think it's difficult for the OSTP to go to the Department of Defense and say, you should close this laboratory, that laboratory, and that laboratory. And go to DOE and say the same thing.

Mr. **MacKay**. But they could make recommendations to us. [Laughter.]

Dr. **David**. Mr. MacKay, respectively—respectfully—I don't think so.

Mr. **Walgren**. The gentleman's time is expired. If I could—and give him a little more time.

Mr. **MacKay**. I just—so what you're saying is, the relevant issues, we can't ask them to deal with it?

Dr. **David**. Well, I don't think you can ask them to deal with that particular issue. If you want a general assessment of the effectiveness of the laboratories—Federal laboratories—you can certainly get that from them. The Packard report is such an effort.

You can certainly get the amount of money that's being spent. You can certainly ask about the number of patents, the amount of technology that's being transferred to the private sector—you can get all of that information.

Mr. **MacKay**. But giving them a role that is the parallel to what NSF is doing, of setting priorities and saying, well, there's a limit on how much we've got and we think you'd get more—you'd get ahead further with this research effort than that one. You can't expect that anywhere in the executive branch?

Dr. **David**. Well, I think you can get that from the individual departments and agencies.

Mr. **MacKay**. Oh, now. [Laughter.]

I mean seriously.

Dr. **David**. That's really where—where it has to come from. If you talk about individual technologies and where those technologies can be exploited, OSTP can certainly speak to that issue. I mean, take the high-temperature superconductors—there are certain areas of government—of the government laboratories—that are very good. For example, the Bureau of Standards in Boulder. And that piece of information is certainly something that OSTP can provide to you.

Mr. MacKay. Okay.

Thank you, Mr. Chairman.

Mr. Walgren. The—why don't you just make, Dr. David—I [illegible] down a little bit earlier that you said that OSTP should be advising the Congress, and it's of some interest. Can they advise us?

We have—apparently our agency is Office of Technology Assessment—but could the OSTP perform a—a real important function to us? And should that be part of their mission as well?

Dr. David. Well, my feeling is that you have a number of resources available to you for studies and for advice—the National Academy of Sciences and Engineering, for example, as well as OTA, and the Congressional Reference Service, and other activities as well.

But if you can find a way of saying that OSTP has a particular relevance in advising you on a particular subject, I think the answer to your question would be yes. After all, the Science Adviser is appointed and approved by the Senate, so he has a congressional mandate. And he is supposed to be able to advise you on whatever you need advice on. You can in effect ask him questions and expect to get a considered answer.

Mr. Walgren. Thank you very much.

Did you have something, Dr. Hornig? I don't mean to——

Dr. Hornig. No, I the answer is that certainly OSTP can be expected to provide assistance to you. But there's no time one can forget that it is also part of the executive office of the President, and that constrains the kinds of ways it can address the problems.

Mr. Walgren. Well, thank you very much on behalf of the committee.

The next panel——

Dr. David. Mr. Walgren, could I ask just one question?

Mr. Walgren. Yes, sir.

Dr. David. I read a version of my testimony which is slightly different from the one I submitted and I would like to have this one go into the record.

Mr. Walgren. Without objection, we'll—we'll work that with you. [Laughter.]

Mr. David. Thank you.

Mr. Walgren. See, both would ordinarily be there—the one you read and the one that you submitted in writing. And that's one of the strange things about these records, is that those who do work with them, they see both the oral statement and then very mechanically a reproduction of what was submitted in writing. So witnesses should feel free to give a different flavor to their oral statement than the written one, and it will be preserved.

Dr. David. Thank you.

Mr. Walgren. Thank you very much.

The next panel: James Beggs, former Administrator of the National Aeronautics and Space Association—Administration; Dr. Guyford Stever, a former Director of the National Science Foundation, and Dr. Donald Fredrickson, former Director of National Institutes of Health.

Gentlemen, we apologize for how the time has gotten away from us, and it's some testimony to the quality of the witnesses—you included—and we really appreciate your coming and presenting some thoughts on this area.

Let's go in the order that I introduced you to the record, and we'll start with Mr. Beggs.

STATEMENTS OF JAMES BEGGS, FORMER ADMINISTRATOR, NATIONAL AERONAUTICS AND SPACE ADMINISTRATION; DR. H. GUYFORD STEVER, FORMER DIRECTOR, NATIONAL SCIENCE FOUNDATION; AND DR. DONALD S. FREDRICKSON, FORMER DIRECTOR, NATIONAL INSTITUTES OF HEALTH AND MEMBER OF THE WHITE HOUSE SCIENCE COUNCIL

Mr. Beggs. Thank you, Mr. Chairman. I just have a brief oral statement.

First, I believe the role of the Science Adviser and the Office of Science and Technology Policy is extremely important for this country. I think without it there would be a very large gap in the Executive Branch and indeed a very large gap in the advice that the—the committees and the Congress—the committees of the Congress and the Congress receive. They are important in advising the President in a staff capacity on the setting of national R&D priorities. And, of course, in this period of extreme budgetary stringencies where resource constraints limit the amount of R&D you can do, the Science Adviser is extremely important in advising the President on what the high payoff R&D opportunities are.

America's lead in the world technology, which is written into our statutory mandates, and our ability to maintain a competitive edge in the world, depends on a wise allocation of the resources available—and that's both public and private.

I do not believe that the OSTP has been very effective—or at least totally effective—in carrying our that statutory mandate. I think it might be instructive to look at the industry or private sector counterpart of the Science Adviser. Every well-ordered American corporation has on its staff a vice president of technology, or a vice president-science and technology, or in some cases, the vice president-engineering, whose job it is to report to the chief executive officer on the important opportunities for the future profitability and productivity of that enterprise.

In addition to that, he has responsibility for coordinating between the operating units of the company as to the appropriate place that they should put their emphasis and money. In addition to that, he has a responsibility for helping to select the R&D personnel that go into the operating units.

Every R&D person in the company knows that the vice president-technical will have an influence in with the CEO in the judgment of his performance. So he knows that the heart and mind of the chief executive will be very greatly influenced and so he per force listens when the vice president-technical comes around to do his job.

Unfortunately, in the Federal sector, the Science Adviser and the OSTP has not served in quite that role. In the first place, he has, in most cases—recent years—not had the direct ear of the President. So the operating departments and agencies, knowing that his staff advice will just be one of a number of different inputs into the President, have tended to by-pass him in the setting of their priorities, and by-pass him in the set of the—in the setting of policy. And to some extent, they have not been cooperative in—in the coordinating role that he otherwise would do.

I think to properly serve in the administration, the Science Adviser must have direct access to the President. He must—he must be able to brief the President on frequent occasions. He must point out to the President the high payoff opportunities for the United States in research and technology because it will be on our ability to select those high payoff opportunities that our future profitability, productivity, and perhaps, just as important, the quality of our products will depend.

Therefore, I would urge the Committee to consider in their deliberations that role—the role of the Science Adviser. As Dr. David remarked, the science advice that the President gets is at least as important as the economic advice that he gets—maybe more important because it impinges directly on our future economic prosperity, and perhaps almost as important as the national defense and intelligence advice that he gets. But the role should be at least equivalent to those advisers.

I applaud what this Committee is doing in reviewing the—the statutory mandate that's been given to OSTP, and I hope that we can make it more effective in the coming administration.

Thank you very much.

Mr. **Walgren**. Thank you, Mr. Beggs. I appreciate that statement.

Dr. Stever.

Dr. **Stever**. Thank you, Mr. Walgren. You know, when you first invited me to attend here, you invited me to attend as a former Science Adviser. And so I thought that I would come prepared to bury OSTP and not to praise it. And now you've changed my role to a former agency head, and I guess I'd better protect it as much as possible. [Laughter.]

The—I will make a general comment, since I went through precisely this exercise that you're doing for a period of 2 years back with Mr. Ford. And I would say that not one issue—almost—hardly a proposal that's been brought up here wasn't considered at that time and wasn't the background of that act.

I have to admire—I always admired the congressional people with whom I worked at that time who put that act together; and, I admire you people for continuing your interest and going at the same hard issues. There are several issues that have come here.

First of all, the only reason we're interested in this, really, is to insure that the social contract which exists between the science and technology community and the Government of the United States in fact gets better and better—we're improving that contract. And it is—although an unwritten contract—it's a very hard contract.

The science and technology community agrees to give the information and the knowledge and the know-how in—in those areas by which the government of this—this government fulfills its responsibility to the people. Those responsibilities are all spread out—spelled out—in the Constitution, and you will note that they're repeated often in the act itself.

So what we were trying to do is to improve something. I think, if we weren't in a budget crunch at the present time, this would be kind of a pretty happy meeting we were having. We would talk about what a fine system we had. We would talk, of course, the fact that the country is so affluent we can't get our American students to go study science and technology. But for the most part, we would praise the diversity of our institutions, the diversity of the performers, the number of government agencies that are interested in science and technology; how well the thing is running.

However, when one has problems, one tends to be critical. I've noticed a lot of the criticisms of OSTP come when people are mixing the two things of making value judgments and giving scientific advice. They are different things. We elect people to the Congress and to the government roles in this country, and we appoint top officials there to make value judgments during their time in government.

The science advising mechanisms really should offer them options, tell them the consequences that sciences of their various actions, interest them in sciences—its importance—in all of the distant—different—aspects of our life.

I think that there are a few things you could knock out of that act. And I—Congressman Brown was hinting at some of those. I think the bookkeeping thing is not—not for that area. But the policy role is still there. And curiously enough, the policy role will boil up in that area whether or not the Office gets more a strength than it is now. And I'll tell you the reason.

The Federal Government often runs into a crisis. In my time as a Science Adviser, the crisis was the energy crisis. And although Mr. Nixon, at that time, had kicked science out of the White House and I was the punt receiver back there who received it at the National Science Foundation. And I tried to make sure that the ball wasn't dropped and fumbled. But I asked people: what was the most important thing I could do in that role? And two things stood out.

Dr. Killian, for example, told me: a budget is a policy statement so work with the OMB. Another thing that I learned was that it—most elements of government looked to short-term problems and the crisis, and that there was a role for long-term studies.

Let's look at the crisis in energy that I received. The PSAC, which had been kicked out of the White House, happened to have made an energy study a few years back, and then they coordinated the agencies of government as to which would take which. We dusted off that report, and we used it very heavily. Though we were not in the White House, as soon as the crisis came, the White House looked around for help. They asked us to put together a science and technology committee to advise them on the R&D budget. We did. We had leading experts and so on.

So, the policy role—if there are people there, can be—will be brought out, whether or not they're accepted into those—into those councils that people were talking about. When there is need for people, we look around and find them.

A coordinating role is a different one. Lots of criticism was made when that act was written because the Science Adviser was also the head of the National Science Foundation, and they said exactly what you said here, namely, that the Science Adviser would favor his own agency. And I'm sure my friend, who is next to testify, will remember certain elements of that. It's quite true, that that's a very difficult role.

I also found when I was head of that agency, and not a Science Adviser, I played that coordinating role very carefully. When I had something to get, namely, a support for a budget in a given area, and I couldn't get it all to myself, I would make sure that I coordinated with the other agencies—so I got a fair portion of it.

In the fields of oceanography, for example, we had wonderful records of good coordination arranged through the White House group. In the field of astronomy, yes, and so on. But in other areas it was a more difficult thing.

So the coordinating role can be done, sometimes effectively, but the agencies are very strong. And if they don't want to be coordinated, it's hard to make—it's hard to coordinate them.

I talked about the study role, the policy role, and the coordinating role, and the advising to the President. All of that was well outlined today, and I'm not going to try to repeat all the good ideas that came from the other people. You just credit me with all the good ideas and knock out all their bad ideas—and that's my speech to you on that. [Laughter.]

But I would like to talk about the most—one of the most important things in my book is for the Science Adviser—is to be on early enough to help the President populate his top government with good people. And it's failed a couple of times, and it's shown up other times it's worked.

First of all, that day after election, the President realizes he's just had the biggest promotion of—that anybody can have in power, and prestige, and every other thing. He looks around for help, and he can get it from the science community in—if he starts early enough.

Don't forget that most of the policy and most of the effective science and technology work in this country is in fact done by those agencies. They're the ones who have the money to spend. They support the budgets. They make them up. They fight them through this government system, OMB, and your Congress. They're the ones with the power. That's where we want the strength in science and technology. And it—I can't imagine a White House system that—I think too strong a White House system would begin to batter them back into a—into a poor kind of system. So I am not for making a czar in the—in the White House.

Well, I won't say any more, sir, except to say that I'm very glad you're doing this—I think it's an important thing. If you don't come up with new solutions, it's important to remind the new people in the world that there are some good old solutions. And if you do come up with some good solutions, that—that will go on to strengthen what has been a growing, more powerful structure in science in our government.

[The prepared statement of Dr. Stever follows:]

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Testimony of H. Guyford Stever on the 1976 Science and Technology Act Hearing at the House Subcommittee on Science Research and Technology

The 1976 Science and Technology Policy Act was an excellent conception, addressing not only the important role of science, engineering and technology in attaining our country's goals, but also legislating the organization of a White House science apparatus to assure that science and engineering talent is brought to bear on national issues at the Presidential level, issues in which scientific and technological ideas play an important role. In this committee's examination of how well that act is served, I believe that the Act's description of the role of Science and Technology should not be changed, for the statements are excellent and even more appropriate for today. There have been frequent criticisms of the performance of the White House science apparatus that it has not performed up to the full intent of the act. This latter is worth examining, but must also include a realistic evaluation of the level of expectations one can sensibly have for that apparatus. Furthermore, the specific criticism of the White House science apparatus which are frequently made today, were made during the period of the 1970s when the 1976 act was conceived. In fact, many of them have been made from the beginning of White House science advice.

It seems clear that paramount to an effective White House science presence is the President's understanding of the many requirements for a science and technology input into the issues which are constant grist in the White House staff mill, which produces the options for his decision making. Among other desiderata in the President's make-up is knowledge of the people and institutions of science and technology, and a recognition of what those people and those institutions need in order to make a superior contribution. Going beyond that, the President should help the people of the country to gain a better understanding of the contribution of science and technology in the affairs of mankind. Who better than the President to take this leadership role; for his government is the biggest user of science and technology in the world; it supports more basic scientific research by far than any other institution, nation, or grouping of nations; it funds almost half of the applied research, development and engineering which is performed in the United States. Other leaders, in Congress, industry and academe, should join the President in that worthwhile effort.

Presidents differ from one to the next, and Congressional and other leaders seem to believe each President has the right to use as he sees fit, the statutorially prescribed elements of the White House staff, the Office of Management and Budget, the Domestic Council, the National

Security Council, the Office of Science and Technology Policy, the Council of Economic Advisors, etc. There is great need for the S&T advisor to attain a true partnership with all these elements as well as a personal rapport with the President. The selection of the Advisor depends not only on his ability to get that kind of rapport, but also on his knowledge of and acceptance in the Science and Technology communities. Statutory support of a membership for him on the Domestic Council as well as the National Security Council could really give that advisor additional clout and status.

The S&T Advisor needs help from an outside the government group admitted to the inside of the White House to build a continuous sounding board for ideas; a group which is trusted both within and outside the White House. It is the element of structure that has changed most often according to the desire of each different Administration from the President's Science Advisory Committee of the Eisenhower, Kennedy and Johnson days to the National Science Board of the Nixon days, to the short-lived President's Commission on Science and Technology of the Ford days, to the Ad-Hoc Advisory Committee of the Carter days, to the current White House Science Council. No matter what form, the need for an outside scientific group with inside clearance is always recognized. Perhaps legislating such a committee into existence would help. It wouldn't hurt to try.

The 1976 Act gives the S&T advisor several different functions. One is to conduct studies on important issues in which S&T are involved, both short term and long, using both his OSTP staff and outsiders. All science advisors have done some of this even though their budgets and staff have been limited. Curiously, the largest study budget was when the Science Advisor was stationed at the National Science Foundation. In any case, the Science Advisor needs a better budget than he now has. With that he can commission studies from many groups outside the White House--governmental, quasi-governmental, and private.

The Act calls in certain circumstances for the S&T Advisor to coordinate the work of many governmental agencies. This is a tough job. Many of those agencies have strong capabilities and they all have their own enabling acts and budgets which give them considerable independence. It is a characteristic of enabling acts in government to give more authority and responsiblity than an agency can handle. What's worse, the overlap in enabling acts is also characteristic. Thus coordination becomes difficult. Even so, using the 1976 legislative Federal Coordinating Committee for Science, Engineering and Technology, science advisors can do some, especially if the OMB is in on the procedure and can support the coordination with a budget of its own. Even more important in making this coordination effective is a perception by the coordinated parties that the S&T Advisor has the ear of the President on the subject of coordinat[illegible].

The Advisor has many other functions; participation as a partner, sometimes junior, sometimes senior, in the handling of issues important to the President; keeping the Staff and the President aware of problems and successes in the scientific and technological world, etc. All of the S&T Advisors functional capabilities are enhanced if it is both perceived and real that he is part of the President's team.

I do not know whether any new Administration, Congress, or the people of the country are now ready to upgrade the position of the Science Advisor, still maintaining his membership in the White House staff without any departmental portfolio. I do know that the country should do this because Science and Technology, already powerful agents in the affairs of man, are continuing to grow stronger.

Mr. **Walgren.** Thank you, Dr. Stever.

Dr. Fredrickson.

Dr. **Fredrickson.** Thank you, Mr. Chairman.

I think that in the third tier of witnesses, one suffers the jeopardy of reiteration, but I will attempt to just focus on what I think are some primary aspects of an oversight group—a coordinating group—like the OSTP is envisioned to be.

I think it's important to put into the record that the universe of science and technology in the United States is so vast and heterogeneous that there really are also limits to the degree of control that's possible or desirable.

I don't think that any one council of scientists and laymen can comprehend, let alone govern, all of these activities or disciplines. And, thus, I think that there will never be a single center able to prescribe how the pie of the Federal resources for R&D will ever be divided. I think that apportionment is going to always be the sum of decisions about many mission added requests for appropriations.

I think the ability of AS—OSTP—to place priorities on those requests is also limited. The office has to be selective about which R&D activities to concentrate upon, while attempting to remain well informed about the principal ones in every sector.

I think the principal role of the Science Adviser, which is now the Director of OSTP in his Office, is to assist the executive branch to carry out constitutional responsibilities which really depend upon effective use of science and technology.

This requires that the Chief Executive have a broad understanding of the deployment of federally supported R&D, and that necessarily involves policy activities at the same time.

The President is also ultimately responsible for the competence of the leaders and, therefore, the quality of management of the major Federal science agencies. And I couldn't agree more with Dr. Stever that here is where the fiber and the strength of the whole ~~system~~ basically depends.

I think that the executive must have cognizance of major shifts in R&D objectives, and they have to be decided by him with recognition that there may be possible effects on the larger universe of science and technology.

Finally, in today's world—and yesterday's, too, perhaps, but much more for the future—the President should also keep some strong strategic interest in the long-term health of American science. In other words, assist the President in fulfilling these responsibilities—Public Law 94-282 has a prescription of independent, expert advice and assistance on policy matters, but I think you've already heard today that this prescription unadorned is deficient.

It is also vitally necessary, as others have said, that the senior science adviser, through whom advice and assistance on R&D are relayed—related—about the inner circle of the President and by whom the interest of the President is projected to the rest of the government and the outside community—that that person have status permitting effective performance of those functions.

I take it—as one example, the case of the Federal Coordinating Council, which was reformed under this law we're discussing today. I attended its opening session when I was the Director of NIH.

Now, I think there was a—at that time, the representatives of the life sciences felt somewhat in awe—perhaps thought we might be run over by the armor and the hardware of the agencies of Defense, Science, and Energy. But the—at that same time, the first session really gave us a sense of importance and a solidarity of the science mission in government.

But that gloss disappeared fairly quickly when later the delegates of the various agencies declined progressively to lower and lower levels and in their ability to speak for constituencies.

Now, some such Federal coordinating councils is still necessary, and it can be useful—and I won't bother to burden you with any anecdotes, but in my personal experience, that was true.

But its power to coordinate Federal science or Federal science in consortium with private science really depends very much upon the projection of an image that the President's personal representative is there—and that there will be executive interest in the outcome.

Now, I think that the offices and the duties of the Director of Science and Technology Policy in some form must be preserved. But I think it's the need for a tighter and more effective coupling of this Office to the White House that rides above all the other concerns that I have.

Each President certainly is going to have a singular mind about his advice on science. I doubt that his or her approach to this matter can ever be solved by legislation. I do hope, however, that the Congress will find a way to convince successive chief executives that a qualified adviser on science and technology must be on the President's staff within the inner circle.

If he or she should require a Cabinet rank in order to maintain liaison with, or have report from, and control over an executive branch office like we have now—such as OSTP—well, I think this would be good for America.

That's all I have to say, Mr. Chairman.

[The prepared statement of Dr. Fredrickson follows:]

STATEMENT OF DONALD S. FREDRICKSON, M.D., FORMER DIRECTOR OF THE NATIONAL INSTITUTES OF HEALTH AND MEMBER OF THE WHITE HOUSE SCIENCE COUNCIL
(February 17, 1988)

Mr. Chairman:

I am pleased to have been asked to present my views this morning on the Office of Science and Technology Policy. I understand that the Committee is especially interested in the impact of the Office and the provisions of the National Science and Technology Policy, Organization, and Priorities Act (P.L. 94-282) upon establishing priorities in competing R&D projects within the Executive Branch and the coordination of R&D activities among Federal Agencies.

My opinions derive from service as Director of the National Institutes of Health from 1975 to 1981, as member of the White House Science Council since 1982, and from experience with other private and quasi-public scientific organizations concerned with research and development.

The Findings stated in Public Law 94-282 amply describe the importance of science and technology to nearly every aspect of our national life and America's international role. Since the law was written, a continuing crescendo of new discoveries and inventions amplifies that importance with each passing year. The committee is aware that the long range strength and vitality of the American scientific enterprise is crucially dependent upon federal support of basic research and the training of scientists and engineers.

This alone mandates a continuous oversight of science and technology by the Executive Branch and the Congress. There are, of course, further needs for coordination and monitoring of science and technology, and there are also limits to the degree of control that is possible or desirable.

The universe of science and technology in the United States is today of great size and heterogeneity. It includes R & D in hundreds of academic and other non-profit institutions and private industry. The Federal Government has many agencies engaged in intramural research and development, and most of them also oversee extramural support through contracts and grants.

No one council of scientists and laymen can comprehend, let alone govern, all of these activities or disciplines. Thus I think there will never be a single center able to prescribe how the pie of federal resources for R&D shall be divided. The apportionment is the sum of decisions about many mission-oriented requests for appropriations.

The ability of OSTP to place priorities upon these requests is also limited. The office too must be selective about which R & D activities to concentrate upon, while attempting to remain well-informed about the principal ones in every sector. For this OSTP has enviable access to many sources of information. In addition to the government agencies, there is a plethora of outside informants.

Despite their pluralism, science and technology remain internally organized by discipline, and their organizations are able to provide valuable assistance to the government. For one example, the National Research Council now has more than 9000 of the best scientists and engineers in the country harnessed to work--without compensation--on questions and problems posed by the Congress or Federal agencies.

The Science Advisory, now the Director of OSTP and his office, is primarily there to assist the Executive Branch to carry out ~~consti~~tutional responsibilities which depend upon effective use of science and technology. This requires that the Chief Executive have broad understanding of the deployment of federally-supported R & D. The President is also ultimately responsible for the competence of the leaders and therefore the quality of management of the major Federal science agencies. Major shifts in R & D objectives have to be decided by the Executive with cognizance of possible effects on the larger universe of science and technology. Finally, in today's world, the President should also keep a strong strategic interest in the long-term health of American science.

To assist the President in fulfilling these responsibilities, OSTP is enjoined in 94-282 [Section 102, (b)(1)] to provide "independent, expert judgement and assistance on policy matters". It is possible for OSTP to perform this function. But this prescription unadorned is deficient. It is also vitally necessary that the senior science advisor--through whom advice and assistance on R&D are relayed about the inner circle of the President, and by whom the interest of the President is projected to the rest of the government and the outside community--have status permitting effective performances of these functions.

I take as one example the case of the Federal Coordinating Council for Science, Engineering and Technology. When I was Director of NIH, I attended the opening session of this body in the new form given it by P.L. 94-282. Although we representatives of the life sciences were in awe of the armor and hardware of the agencies of defense, space and energy, this first session gave us a sense of importance and solidarity of the science mission in government. This gloss disappeared, however, when later the delegates of the agencies declined progressively in level and ability to speak for their constituencies. Some such federal coordinating council should be continued as a useful venue for interagency negotiations. Its power to coordinate, however, depends upon the projection of an image that the President's personal representative for science is there, and that there will be Executive interest in the outcome.

The office and duties of the Director of Science and Technology Policy must also be preserved. It is the need for a tighter, more effective coupling of this office to the White House that rides above the other concerns I have. Each President has a singular mind about advice on science. I doubt that his or her approach to this matter can be solved by legislation. I hope, however, that the Congress will find a way to convince successive Chief Executives that a qualified advisor on science and technology must be on the President's staff, within the inner circle. If he or she should require Cabinet Rank--in order to maintain liaison with, and appropriate control over, an Executive Branch office such as OSTP--this would be good for America.

Thank you, Mr. Chairman, I will be pleased to answer any questions you or the Committee may have.

CURRICULUM VITAE

Name: Donald S. Fredrickson

Home Address: 6615 Bradley Boulevard, Bethesda, Maryland 20817

Education: B.S., University of Michigan, 1946
M.D., University of Michigan, 1949

Relevant Employment:

1949-1953	Medical and Research Training: Peter Bent Brigham Hospital, Massachusetts General Hospital, and Harvard Medical School
1953-1974	National Heart Institute, Research Scientist, Clinical Director, Director of Research, and Director
1974-1975	President, Institute of Medicine, National Academy of Sciences
1975-1981	Director, National Institutes of Health
1981-1983	Scholar-in-Residence, National Academy of Sciences
1984-1987	President and CEO, Howard Hughes Medical Institute

Other Relevant Activities:

Member, White House Science Council (1982-)

Chairman, Committee on Medicine, Federal Coordinating Council for Science, Engineering, and Technology (1977-81)

Chairman, Federal Committee on Research on Biological Effects of Ionizing Radiation (1978-81)

Member, Governing Board, National Research Council (1981-83)

Chairman, Interagency Committee on Recombinant DNA Research (1977-1981)

Member, National Academy of Sciences Committee on Government-University Relationships in Support of Science (1981-83)

Mr. **Walgren**. Thank you, Dr. Fredrickson.

It certainly is a dilemma to reach for structure, and then find that the structure can't do what you want it to do.

I guess I've been struck by how the recent science advisers have been of my own generation. And I've always felt that wisdom resided a little bit ahead of me in time. And I wonder whether—whether that's a—a reflection of just this particular President's style. And I can't remember back into the 1970's.

I guess my question is: Is there a key in this—in the standing of whoever it is that is this person?

Dr. **Fredrickson**. I think there's—the key is—is in the chemistry between individuals. But I think that those who are tremendously interested in it, as is this Committee and the Congress generally, and the science community, ought to bear in any way that it can to—to make it clear that prestige; the ability to be objective; to have a general view of the role of science and technology in our civilization is crucial. That the Federal Government is the crucial support of basic science and the training of scientists and engineers in this country needs to be conveyed to the President and those very closely around him who will early assemble his Science Adviser. It should not be 6 months too late. He has to choose all those agency heads, and he needs to be there.

He needs to be a remarkable person in a way. He has to not only understand science and technology in some sphere. He also must understand government because it's a strange creature.

Mr. **Beggs**. I subscribe to that. It would be very helpful if you could find a man of national reputation, or a woman of national reputation, in the science community or the technical community, who had had experience in both the private and public sectors, because it's vital that—that they understand that and they understand the relationship between government and the private sector most particularly, private enterprise and the industry.

But I don't think you can attract such an individual unless you give them the opportunity to have real effect and real influence.

Mr. **Walgren**. Dr. Stever.

Dr. **Stever**. I'd like to second that. There is such this phenomenon, cocoon, called the transition period. I've been through four of them. Three times on the positive side, and once on the negative side. And two of them worked reasonably well, and two didn't. I won't say which is which.

But during that initial period, right after the President is elected, and he appoints a committee—which he always does—on science and technology in this transition team, lists are made up for various jobs. And I recall one list that had almost 15 names—and they got nobody on that list. I think some of them may have been dropped off because of politics, but many of them were approached.

And what Dr. Beggs just said—I know some of the very best scientists in the country that actually turned down the job because he felt—they felt—that it was not a powerful enough job.

Mr. **Walgren**. So if we're to—to give that standing to it—or at least it should be our responsibility to give that standing to it so that somebody who is—who has reached that standing in the scientific community would be at least willing to do it, or at least give it a try.

And if it really is something that's a kind of an office that may or may not have much formal standing—we have been undercut, the—the ability of the President to——

Dr. **Stever**. Please don't abandon it. You know, build it up.

Mr. **Walgren**. So there really is something that we can contribute in that—that. My guess is that it's lacking now. Is that your view of the structure of it?

I mean, as a—from the congressional standpoint, it's hard to affect very much other than structure. So maybe I'm trying to make that more important than it might be.

Mr. **Beggs**. You can't force—you can't force the President——

Mr. **Walgren**. No.

Mr. **Beggs**. Use someone on the staff that he doesn't want to use.

On the other hand, if in the transition you are looking for a man of high standing, high reputation, you've got to be able to offer him a job that has substance, influence, and an opportunity to achieve something. And in that transition period, I totally agree with what Dr. Stever said. Its been my observation that—that the long lists they develop, they generally have a very difficult time in attracting a proper man—at least in some—some of the recent administrations—that is, the man they want.

Mr. **Walgren**. Yeah. But—but isn't it almost true that—that it's very hard for any President to have a—a very close relationship with any given individual that comes along in an administration. You can't predict that from the outset.

Therefore, the attraction of this office has to be something other than that—that chemistry—relying on that chemistry alone. If you were asked to take this position and the only reason you could really say it would justify your time is if the President really did see you once a week for a substantive interaction. And you couldn't—certainly could not bank on that. There are many Congressmen who don't even talk to their staffs, you know. [Laughter.]

And I'm sure when they were hired, they thought there would be a very close relationship there.

So my point is: Is there some structure—structural elevation that can be recommended that would at least give the next President a chance of competing for somebody of the value that we hope would fill this slot?

Dr. **Stever**. I think what your question is behind several of our colleagues suggesting that this man be given Cabinet status—because the problem has been there all along. Dr. Killian, by the way, had a favorite expression in speeches after he left. He said, scientists should be on top, not on tap. And that was a very brief way of saying that they didn't—they didn't have enough power; their voice wasn't heard enough.

Dr. **Fredrickson**. The position should reflect the importance that science and technology now have to all of national life and its international role.

I perhaps defining it as that important, you may introduce some safeguards into its——

Mr. **Walgren**. That's peculiarly congressional responsibility, to define it as that important——

Dr. **Fredrickson**. I think yes, yes.

Mr. **Walgren** [continuing]. Even though a President may choose not to.

Mr. MacKay, can I——

Mr. **MacKay**. No questions.

Mr. **Walgren**. That phrase "prescription unadorned" that you used, Dr. Fredrickson, is an interesting—I guess it comes back to the same concept. You were saying that the description, I gather, of this role, unadorned, is deficient.

Dr. **Fredrickson**. Yes.

Mr. **Walgren**. Let's see, what else I had.

I wanted to ask if looking back on the last 10 years of this Office from this position, or from this point in time, Miss Schneider asked Dr. Graham what his specific accomplishments were—but not focusing just on Dr. Graham, but for the 10-year period.

What are the greatest regrets? What did you hope for in 1976 that—that you feel has been least fulfilled?

Dr. **Stever**. I was—wanted to as we talked here, I wanted to bring up my early remark about burying the OSTP. I think there have been many accomplishments of all of those people—not all that we wanted. And quite often we downgraded them because they took value judgments—their administration had value judgments which didn't agree with all of the value judgments of the science community.

But I think we have to be careful. They've done some good things too. And so we shouldn't deal here from just an absolute most pessimistic point. But I think the business of making this country, and any President we get through the electorate, recognize the immense importance of science and technology to all of the things that were mentioned in the bill, that were mentioned here—all of the different fields: health, defense, economic strength, every one of them—every one of those—science and technology has a necessary role—not always the commanding role, but the necessary role.

When the people really understand that, then I think we will begin to get leaders. This means there's a long-term educational problem for the people as to what the role of science and technology is.

Mr. **Beggs**. I'd like to second that one, Mr. Chairman.

The question was asked earlier in this hearing as to what you could do to get more attention, I think, to raise the level of conscienceness among the American public of the importance of science and technology to them. It's just not an issue that is discussed enough in the political arena.

The press doesn't pay enough attention to it; and, the public in general, while they are very interested in science and technology—when you take polls, it always comes up near the top is things that the public is interested in.—It is not high in their conscienceness in a political sense, so they don't tend to ask candidates the question: What are you going to do on—what is your science and technology policy? What—why candidates do not per force, as Mr. Nagle said, do not per force discuss—discuss their science and technology initiatives or policy on the campaign trail. I think that's very unfortunate that it isn't higher in public conscienceness in a political sense.

Mr. **Walgren**. Going back to this concept of structure and how you—how you best bet that a President would—would do the best by this area, about the only handle we have is his wanting to be judged well and meet approval. And one measure would be vacancies in a structure.

I remember, when Carl Sagan was lamenting the onset of the present administration, he told a story about coming to Washington to try to make a point and not finding anybody to talk to—that there was nobody in this office, and nobody in that office, and nobody in another office. This is before they were eventually filled, but it was a very slow start from his standpoint in the areas of his interest, in any event.

So my question is: If we use the leverage of vacancy as a measure of whether a President is really seriously giving an effort in this area, should an office not only have a head but it should—structurally should it have so many positions? Should it have depth to it that is placed in structure that you can then look and see whether it's being used or not used?

Dr. **STEVER**. I think it's a very good point.

Mr. **BEGGS**. A very good point.

Dr. **FREDRICKSON**. It is, indeed. But still, there really—the—it's the implementation that will be the test of whatever you write in legislation in this instance.

You have a good law, but that's what's missing. We've discussed—and somehow that has to be raised to the level of the consciousness of those who will swarm in upon this new executive and give him advice.

Last time you could have gone to the Heritage Foundation if you couldn't find anybody in the offices. But we hope it will be somewhat broader than its origins this time.

Mr. **WALGREN**. Well, all right. Well, I certainly want to express our appreciation and particularly for your patience and also for your perspectives. We appreciate it very much.

Mr. **BEGGS**. Thank you, Mr. Chairman.

Mr. **WALGREN**. The next panel: William Golden, the president of New York Academy of Sciences; Solomon Buchsbaum, executive vice president of Bell Laboratories; Dr. George Bugliar—Bugliarello—president of Polytechnic Insti—Polytechnic University—and Dr. Fred Leavitt, director of Government Science Relations for Dow Chemical.

I apologize for pronunciation and welcome you all to——

And I guess it's Dr. Leavitt, is it? And it's Bugliarello?

Dr. **BUGLIARELLO**. Bugliarello—perfect.

Mr. **WALGREN**. Very good. Thank you.

Well, let's proceed in the order in which I introduced you to the record. And again, written statements that you might like to make and later comments you would like to give us in writing would certainly be made part of the record—and you can count on that.

Let me welcome each of you. I appreciate your patience. This has been a long hearing and we had—we're—certainly everyone was ready to go to lunch awhile ago. So if you could take that into account in giving us some perspectives on this area, we'd certainly appreciate it. So, first, Dr.—Mr. Golden.

STATEMENTS OF WILLIAM T. GOLDEN, PRESIDENT, NEW YORK ACADEMY OF SCIENCES; DR. S.J. BUCHSBAUM, EXECUTIVE VICE PRESIDENT, AT&T BELL LABORATORIES; DR. GEORGE BUGLIARELLO, PRESIDENT, POLYTECHNIC UNIVERSITY, NEW YORK; AND DR. FREDERICK C. LEAVITT, DIRECTOR, GOVERNMENT SCIENCE RELATIONS, DOW CHEMICAL

Mr. GOLDEN. During the period of patience we have been edified, so the time has not been——

My name is William T. Golden. I'm, as indicated, president of the New York Academy of Sciences. I'm also treasurer and a member of the board of the American Association for the Advancement of Science, and have been for many years. My material will be in the record.

I'm here as an individual, and I'm not representing those or any other organizations.

With that preamble, I would say that last Saturday, February 13, at the annual meeting of the American Association for the Advancement of Science in Boston, an all-day program entitled "Science Advice to the Next President of the United States," drew a standing room only audience of some 300 scientists, political scientists, press, and concerned citizens and an overflow crowd of reporters at the press conference.

Dr. George Bugliarello, president of Polytechnic University, and I were cochairmen. The other speakers were distinguished and well qualified by relevant experience. They were, in order of appearance: Lewis Branscomb, John Gibbons, William Carey, Guy Stever, Paul Doty, Roland Schmitt, William Graham, Joshua Lederberg, Ashton Carter, David Hamburg, and Don Price. Jay Keyworth, scheduled to speak, was prevented by weather from reaching Boston.

The program had a purpose—very similar to the purpose that you, Mr. Chairman, have stated, I think, to be the essential purpose of these hearings that your Committee is conducting.

The program had a purpose. It aimed to attract attention to the necessity for quality advice on science and technology issues to the President of the United States, as well as to the Congress and to the Judiciary. And it aimed to provoke thought, to stimulate discussion, and to encourage action.

Emphasis was on reconsideration and improvement of existing organizations and mechanisms, conscious of the need to adapt to changing circumstances. The focus was on the future, mindful that the approaching 1988 elections create an important and timely first target of opportunity.

The speakers were selected for wisdom, experience, and love of country, without regard to political affiliations. The diversity of views expressed were a foretaste of the original essays by the 85 distinguished and well qualified authors, including the AAAS speakers, in the book, *Science and Technology Advice to the President, Congress, and Judiciary,* of which I am editor and coauthor. Ed David referred to that earlier.

It has just—literally just a few days ago been published by Pergamon Press. The list of 85 authors and the table of contents is germane to your hearings and is attached as a supplement to my written statement.

In that book, a strong consensus, but not unanimity, emerged, favoring a strengthened presidential science and technology advisory organization as an essential ingredient in policy formulation and decisionmaking on a broad range of issues woven into the fabric of modern life.

With certain notable exceptions and numerous variations of detail, the preponderant recommendations are for the reestablishment of a Presidential science and technology organization in the Truman/Eisenhower pattern. That is, a full-time science and technology adviser to the President—might be called STAP—and a President's Science and Technology Advisory Committee, or Council, which would be PSTAC.

Among the thoughtful variations and alternatives on this basic theme are several suggestions—including one by Frank Press, President of the National Academy of Sciences, and former adviser to President Carter—to elevate the President's Science and Technology Adviser to Cabinet rank, possibly as Secretary of Science without portfolio. That is, without the constraints and competitiveness of operating departmental responsibilities—you have heard that advocated by earlier speakers on this program—although a few writers, including Jay Keyworth, advocate an actual operating Department of Science, with a budget and so on.

A truly novel alternative—which you heard expressed—is Edward—Edward David's suggestion for creation of a not-for-profit corporation, a Federal Contract Research Center [FCRC] to provide science and technology advice to the President and his staff.

Dr. David was the very able Science Adviser, as you know, to President Nixon.

In our world in which, increasingly, science and technology profoundly influence the lives of everyone, it is essential that the President—as well as the Congress—have the benefit of informed and trusted advice.

As a wise man has pointed out, "Lack of knowledge will not prevent him from having opinions; it will only prevent him from having informed opinions." And, absolutely essential, the President must be receptive—though not compliant.

If there were time I could add—Mr. Chairman, do you want me to stop at this point or add some additional relevant remarks?

Mr. WALGREN. Tell you what—if you would withhold at this point, we will come back to you and give you a good opportunity to make some additional points.

Mr. GOLDEN. Surely.

[The prepared statement of Mr. Golden follows:]

40 WALL STREET
NEW YORK, N. Y. 10005

February 29, 1988

Dear Mr. Walgren:

Re: Subcommittee on Science, Research and Technology
Oversight Hearings on the
Office of Science and Technology Policy
February 17, 1988

Extended remarks were invited for the printed record. I submit the following to be considered for addition to my prepared remarks (copy attached), which you already have.

* * * * * * * * * * *

The earlier book, Science Advice to the President (William T. Golden, editor; Pergamon Press, 1980) is still timely. Along with the recently published Science and Technology Advice to the President, Congress, and Judiciary (Pergamon, 1988), it provides original essays by every past Science Advisor to the President, by the incumbent, by a large number of former members of the President's Science Advisory Committee, and by other individuals especially well-qualified by experience. Together, the books comprise more than 100 especially prepared essays on the subject.

From my essay, "Contours of Wisdom" in the 1980 volume (pages 4-5), I excerpt the following portions as especially apposite:

> "The focus of United States policy-making is the President. He receives advice from many sources, is influenced by many factors, and is the final integrator. Harry Truman said it economically, 'The buck stops here.'
>
> [I am] confident of the timeliness and perennial importance of science and technology in governance, progress, and survival. [My] more specific judgments, which are consistent with the preponderant views of the other authors [in this volume], may be summarized as follows:
>
> - Science and technology advice are essential to the President as inseparable ingredients in a broad panoply of policy-making on domestic and foreign issues. The

principles are unchanged from World War I and post-World War II periods. However, domestic concerns, including economics and what may be called social issues (such as health care, ecology, energy, education transportation) have grown in importance over the decades; while defense considerations, including both military matters and the quest for arms control, remain vital to national human survival.

- Congress, also, needs advice on scientific and technological matters. It has various sources available to it, including (under Public Law 94-282, The National Science and Technology Policy, Organization and Priorities Act of 1976) the Director of the Office of Science and Technology Policy, who plays the dual role of Director of that Office and Science Advisor to the President....

- (a) The President's Science Advisory Committee should be re-established. It should be composed of generalists of stature, wisdom, discretion, independence, and patriotic dedication. There are too many specialties to have all the important ones adequately represented. Nor should reliance be placed on one expert in each special field. Pluralism and diversity of ideas would be attainable under a small PSAC structure by the use of supplementary ad hoc committees (not Presidentially-appointed) on specific issues, consisting of qualified outsiders with the participation or one or more members of PSAC itself. Perhaps standing subcommittees would evolve in major subject areas.

Keenly aware of Occam's Razor and the Principle of Parsimony, I believe the Committee should consist of a small number, perhaps nine to not over 15 men and women. The small number will encourage collegiality with independence, and enhance the individual sense of responsibility. All the members should be chosen for merit, or meritorious members will not serve. They must understand the practical processes of politics and government. They must be courageous, but not foolhardy. Indeed, were they not courageous, they could not effectively serve the President. The prestige they bring with them will be enhanced by their Presidential appointment, and their usefulness and survival will depend on their wisdom.

Broadly, the physical, biomedical, and perhaps certain social sciences should be represented; but not every member should be a practicing scientist. Loyalty to the President, but not subservience, is essential.

> Esprit de corps should develop, and the expression of divergent views, within the intimacy of the group, should be of encouraged. Criticism is more valuable than praise if expressed privately. Resignation is the honorable condition precedent to public disagreement with the policies of the President one serves. It should be self-evident, and history demonstrates, that to be effective any such committee must have the confidence, both for judgment and for loyalty, of the President it exists to help.
>
> (b) To assure the requisite stature and visibility, both within and outside the government, the members of PSAC should be Presidential appointees....
>
> (c) It should be noted that Congress thoughtfully provided for the "periodic revision and adaptation" of PL94-282 (e.g., Sec. 102 (a) (6)). This could provide alternative means for achieving re-establishment of a President's Science Advisory Committee as well as other improvements in the Act.... "

* * * * * * * * * * * *

Respectfully submitted,

William T. Golden

Mr. Doug Walgren, Chairman
Subcommittee on Science, Research and Technology
U.S. House of Representatives
Committee on Science, Space, and Technology
Suite 2321 Rayburn House Office Building
Washington, DC 20515

Statement of William T. Golden to the
Subcommittee on Science, Research, and Technology
House Committee on Science, Space, and Technology
February 17, 1988
Washington, DC

Last Saturday, February 13th, at the annual meeting of the American Association for the Advancement of Science in Boston, an all-day program entitled "Science Advice to the Next President of the United States" drew a standing-room only audience of some 300 scientists, political scientists, press, and concerned citizens; and an overflow crowd of reporters at the press conference. Dr. George Bugliarello, president of Polytechnic University, and I were co-chairmen. The other speakers were distinguished and well qualified by relevant experience. They were, in order of appeareance, Lewis Branscomb, John Gibbons, William Carey, Guy Stever, Paul Doty, Roland Schmitt, William Graham, Joshua Lederberg, Ashton Carter, David Hamburg, and Don[illegible] Price. Jay Keyworth, scheduled to speak, was prevented by weather from reaching Boston. *

The program had a purpose. It aimed to attract attention to the necessity for quality advice on science and technology issues to the President of the United States (as well as to the Congress and to the Judiciary). And it aimed to provoke thought, to stimulate discussion, and to encourage action. Emphasis was on reconsideration and improvement of existing organizations and mechanisms, conscious of the need to adapt to changing circumstances. The focus was on the future, mindful that the approaching 1988 elections create an important and timely first target of opportunity.

The speakers were selected for wisdom, experience, and love of country, without regard to political affiliations. The diversity of views expressed were a foretaste of the original essays by the 85 distinguished and well qualified authors, including the AAAS speakers, in the book, Science and Technology Advice to the President, Congress, and Judiciary of which I am editor and co-author. It has just (a few days ago) been published by Pergamon Press. The list of 85 authors and the table of contents is germane and is attached as a supplement to my written statement.

In that book, a strong consensus, but not unanimity, emerged, favoring a strengthened Presidential science and technology advisory organization as an essential ingredient in policy formulation and decision-making on a broad range of issues woven into the fabric of modern life. With certain notable exceptions and numerous variations of detail, the preponderant recommendations are for the re-establishment of a Presidential science and technology organization in the Truman/Eisenhower pattern: a full-time Science and Technology Advisor to the President (STAP) and a President's Science and Technology Advisory Committee (or Council) (PSTAC).

Among the thoughtful variations and alternatives on this basic theme are several suggestions (including one by Frank Press, President of the National Academy of Sciences, and former Science Adviser to President Carter) to elevate the President's Science and Technology Advisor to Cabinet rank, possibly as Secretary of Science without portfolio; that is, without the constraints and competitiveness of operating Departmental responsibilities (although a few writers, including Jay Keyworth, advocate an actual operating Department of Science). A truly novel alternative (with which ? ~~this editor~~ disagrees) is Edward David's suggestion for creation of a not-for-profit corporation, a Federal Contract Research Center (FCRC), to provide science and technology advice to the President and his staff. Dr. David was the very able Science Adviser to President Nixon when the latter, contrary to Dr. David's advice, abolished the office in 1973.

In our world in which, increasingly, science and technology profoundly influence the lives of everyone, it is essential that the President (as well as the Congress) have the benefit of informed and trusted advice. As a wise man has pointed out, "Lack of knowledge will not prevent him from having opinions; it will only prevent him from having informed opinions." And, absolutely essential, the President must be receptive--though not compliant.

....

*Brief biographical data on the speakers:

Lewis Branscomb, Professor, John F. Kennedy School of Government, Harvard University; former chairman, National Science Board; former vice president in charge of research, IBM; former director, National Bureau of Standards.

George A. Keyworth II, former Science Adviser to President Reagan

John H. Gibbons, Director, Congressional Office of Technology Assessment

William D. Carey, former Executive Officer, American Association for the Advancement of Science; former assistant director, Bureau of the Budget

H. Guyford Stever, former Science Adviser to President Ford; former Director, National Science Foundation; Foreign Secretary, National Academy of Engineering

George Bugliarello, president, Polytechnic University

Paul M. Doty, director, Center for Science and International Affairs, John F. Kennedy School of Government, Harvard University

Roland W. Schmitt, chairman, National Science Board; vice president in charge of research, General Electric Company

William R. Graham, Science Adviser to President Reagan

Joshua Lederberg, Nobel laureate; president, Rockefeller University

Ashton Carter, professor, John F. Kennedy School of Government, Harvard University

David A. Hamburg, president, Carnegie Corporation of New York; former president, Institute of Medicine; former president, American Association for the Advancement of Science

Don K. Price, former assistant director, Bureau of the Budget; professor, John F. Kennedy School of Government, Harvard University

/cvk

Contents

Acknowledgments xv

Introduction
William T. Golden, Editor; Pres., NY Academy of Sciences 1

Then and Now: Personal Reflections
William T. Golden, Editor; Pres., NY Academy of Sciences 5

PART 1: PRESIDENT AND EXECUTIVE BRANCH

Science Advice at the Cabinet Level
Richard C. Atkinson, Chancellor, UC/San Diego 11

Notes on Science Advising in the White House
William O. Baker, Chmn., Rockefeller U. 16

Science, Technology and Democracy
Harry G. Barnes, Jr., US Ambassador to Chile; Former Ambassador to India 28

Science and Technology in Presidential Policymaking: A New Dimension and Structure
David Z. Beckler, Exec. Officer, PSAC; Ass't to Presidential Science Advisors (1953–73) 31

The Limitations of White House Science Advice
William A. Blanpied, National Science Foundation 39

Supporting the President's Need for Technical Advice
Lewis M. Branscomb, Former Chmn., National Science Bd. 44

Issues in High-Level Science Advising
Harvey Brooks, Prof., Harvard U. 51

A New Institution for Science and Technology Policy-Making
George E. Brown, Jr., Mem. of Congress 65

On Advising the Federal Government
S. J. Buchsbaum, Chmn., White House Science Council 71

A Time for Renewal: The Next President Needs What Eisenhower and Kennedy Had
McGeorge Bundy, Prof., NYU; Former Special Asst. to Pres. for National Security Affairs 74

The New Longevity: Case Illustration of Needed Science and Technology Advice to the Three Branches of Government
Robert N. Butler, Former Dir., National Inst. on Aging 79

Science Policy: USA and USSR
William D. Carey, Former Exec. Officer, AAAS 83

A New Era in Science Advising
Ashton B. Carter, Assoc. Dir., Center for Science and International Affairs, Harvard 87

Science Advice and Social Science Advice to Government
James S. Coleman, Prof. of Sociol., U. of Chicago; Former Mem., PSAC 90

The United States Has No Adequate Mechanism to Set Long-Range Research Policy
Dale R. Corson, Pres. Emeritus, Cornell U. 95

White House Science Advising
Edward E. David, Jr., Science Advisor to Pres. Nixon 104

Science Policy Advice to the US Government
John Diebold, Management Consultant 112

Restoring General Science's Head: How the Science Advisor Could Lead
William Drayton, Former Ass't Adm. of EPA 117

Need for a Science Advising Mechanism
Sidney D. Drell, Co-Dir., Stanford Center for Internat'l Security and Arms Control 122

The Need for a New Start in Presidential Science Advice
A. Hunter Dupree, Historian 126

Government and International Relations: The Science of Living Together
Roger Fisher, Prof. of Law, Harvard U. 133

Science Advice to the President
Gerald R. Ford, Former Pres. of the U.S. 140

Toward a Nation Healthy, Wealthy, and Wise
Richard L. Garwin, IBM Fellow; Former Mem., PSAC 144

A View from the Sidelines
Eli Ginzberg, Prof. Emeritus of Econ., Columbia U. 148

The Role of the President's Science Advisor
William R. Graham, Science Advisor to Pres. Reagan 152

Science and Technology Advice to the President
Norman Hackerman, Former Chmn., National Science Bd. 155

Science, Technology and a World Transformed: Time to Upgrade the Government's Efforts
David A. Hamburg, Pres., Carnegie Corp. of NY 158

Recommendations for Changes in Government Science Policy
Cyril M. Harris, Acoustical Engineer; Prof., Columbia U. 163

Presidential Science Advising: A Memoir and a Prescription
Theodore M. Hesburgh, Former Pres., Notre Dame U. 165

"To Promote the Progress of Science . . .": Some Bicentennial Considerations
R. Gordon Hoxie, Pres., Center for the Study of the Presidency 167

The Sublimation of the Science Advisor
Thomas H. Johnson, Dir., Science Research Lab., US Military Academy 176

Science Advice During the Reagan Years
George A. Keyworth II, Former Science Advisor to Pres. Reagan 182

Science Advice for the President: Reflections from a Long Look Backward
Robert N. Kreidler, Pres., Charles A. Dana Foundation 204

The Science Advisor: Who Needs One?
Donald N. Langenberg, Chancellor, U. of Illinois, Chicago 218

Confidential Advice in the Public Interest: PSAC's Dilemma
Joshua Lederberg, Pres., Rockefeller U.; Nobel Laureate 222

Science Advising
Leon M. Lederman, Dir., Fermi National Accelerator Lab. 224

Quality of Technical Decisions in the Federal Government
Gordon J. F. MacDonald, Chief Scientist, The MITRE Corp., and Charles A. Zraket, Pres., The MITRE Corp. 226

Science Advice to the President
Paul A. Marks, Pres., Memorial Sloan-Kettering Cancer Center 233

Federal Policies Affecting the Research Strengths of Universities and Colleges Need Better Coordination
Walter E. Massey, Vice Pres. for Argonne National Lab., U. of Chicago; Pres.-Elect, AAAS 239

PART 2: CONGRESS

Scientific Advice to the Congress
Philip H. Abelson, Former Ed., Science; *Former Pres., Carnegie Inst. of Washington* 395

Reflections on Science, Technology and Congress
Emilio Q. Daddario, Former Dir., Office of Technology Assessment 400

Science and the US Senate
Pete V. Domenici, Sen. from New Mexico 405

Federal Investment in Science and Technology: Priorities for Tomorrow
Don Fuqua, Former Chmn., House Science and Technology Committee 409

Science, Technology, and Law in the Third Century of the Constitution
John H. Gibbons, Dir., Congressional Office of Technology Assessment 415

Science and Technology Advice and Education: A Long-Term View
Bill Green, Mem. of Congress 420

Congress Needs Informal Science Advisors: A Proposal for a New Advisory Mechanism
James Everett Katz, Sociologist, Bell Communications Research 425

Science Advice, Government, Education, and the Economy
John Kerry, Sen. from Massachusetts 431

Science and Technology Advice for the President and Congress: The Need for a New Perspective
Robert A. Roe, Chmn., House Committee on Science, Space and Technology 435

Fulfilling the Science and Technology Advisory Needs of Congress
Jeffrey K. Stine, Historian of Science 443

Science Advice to the Congress: The Congressional Science and Engineering Fellows Program
Michael L. Telson, Staff, House Committee on the Budget, and Albert H. Teich, Head, Public Sectors Program, AAAS 447

PART 3: JUDICIARY

Science and Technology Advice in the Judiciary: The Path Ahead
Danny J. Boggs, Judge, US Court of Appeals 455

New Interfaces of Science and the Law
Bennett Boskey, Former Dep. Gen. Counsel, US AEC 461

On Limiting the Scope for Scientific Evidence
Richard A. Epstein, Prof. of Law, U. of Chicago 465

Judicial Understanding of Science
Edward Gerjuoy, Physicist and Lawyer 470

Science and Technology: Advice to the Judiciary
Robert B. McKay, Prof. of Law, NYU 475

Improving the Courts' Ability to Absorb Scientific Information
Maurice Rosenberg, Prof. of Law, Columbia U. 480

Technology and the Courts
Patricia M. Wald, Chief Judge, US Court of Appeals for the DC Circuit 484

PART 4: APPENDICES AND INDEX

Appendix A: Observations on Presidential Science-Advising (An Interview by William T. Golden, 1979)
George B. Kistiakowsky, Science Advisor to Pres. Eisenhower 491

Appendix B: Back to Science Advisers
Hans Bethe and John Bardeen, Professors Emeriti at, respectively, Cornell U. and U. of Illinois; Nobel Laureates 503

Appendix C:
Name Index to Science Advice to the President, *New York, Pergamon Press, 1980* 505

Index of Names 513

Science Advice to Government
Alan H. McGowan, Pres., Scientists' Institute for Public Information 243

Science and the Federal Government
David Packard, Chmn., Hewlett-Packard Co.; Former Dep. Sec. of Defense 245

Science: Advice and Vision
Heinz R. Pagels, Exec. Dir., NY Academy of Sciences 251

The Dilemmas of Decision-Making from AIDS to SDI
David Perlman, Past Pres., National Association of Science Writers 255

To Foster Science: Restore University Autonomy
Gerard Piel, Chmn. of the Bd., Scientific American 262

A Prescription for Science and Technology Advising for the President (An Interview by William T. Golden)
Frank Press, Pres., National Academy of Sciences; Science Advisor to Pres. Carter 266

Scientific Mediation and Technology Policy Convergence
Joel R. Primack, Prof. of Physics, UC/Santa Cruz, and Nancy E. Abrams, Attorney 275

Presidential Science Advising and the National Academy of Sciences (An Interview by William T. Golden)
I. I. Rabi, Former Mem., PSAC; Nobel Laureate 280

Science Policy—Theory and Reality
Simon Ramo, Dir. Emeritus, TRW, Inc. 289

Memorandum to the President-Elect Re: The White House Science Advisor
Donald B. Rice, Pres., The RAND Corp. 294

Science and Technology Advice to Government
David Z. Robinson, Exec. Vice Pres. and Treas., Carnegie Corp. of NY 298

Some Thoughts on the Management of Technologies in Medicine
David E. Rogers, Former Pres., Robert Wood Johnson Foundation 302

Advising the President on Science and Technology: Why Can't We Get It Right?
Robert M. Rosenzweig, Pres., Association of American Universities 306

Federal Policies for Academic Research
Roland W. Schmitt, Chmn., National Science Bd.; Vice Pres., General Electric Co. 309

Technological Advice to the President: A Two-Way Street
Robert C. Seamans, Former Sec. of Air Force 315

Matching Reality to Need
Frederick Seitz, Past Pres., National Academy of Sciences; Pres. Emeritus, Rockefeller U. 321

A Case for Evaluating the Nature of Scientific and Technological Advice to the Federal Government
John B. Slaughter, Former Dir., National Science Foundation 325

Science Advice to the Seats of Power in Government
H. Guyford Stever, Science Advisor to Pres. Ford; Former Dir., National Science Foundation 330

Science Advice to the Government: Formulation and Utilization
Gerald F. Tape, Former Pres., Associated Universities, Inc. 336

The Future Role of the Science Advisor
Edward Teller, Mem., White House Science Council 344

Presidential Studies and Science Advising
Kenneth W. Thompson, Dir., Center for Public Affairs, U. of Virginia 348

Science and Technology Advice: Some Observations
Alvin W. Trivelpiece, Exec. Officer, AAAS 353

Science Advice to the President
John G. Truxal, Prof., State U. of NY, Stony Brook 358

Science Advice Thirty Years Later
Alvin M. Weinberg, Former Dir., Oak Ridge National Lab. 362

Repairing Radar for the Ship of State
Edward Wenk, Jr., Univ. of Washington 366

The Rise and Fall of the President's Science Advisory Committee
Jerome B. Wiesner, Science Advisor to Pres. Kennedy 372

Over-Regulation: Required or Ridiculous?
Rosalyn S. Yalow, Prof., Mt. Sinai Medical School; Nobel Laureate 385

Thinking About Science Advice
Adam Yarmolinsky, Provost, U. of Maryland 388

William T. Golden

I am president of the New York Academy of Sciences and Treasurer and a member of the Board of Directors of the American Association for the Advancement of Science. However, I am speaking as an individual and not as a representative of an organization. Initially, as Special Assistant to President Truman, I designed the science advisory organization utilized by him and later by President Eisenhower: a Science Adviser reporting directly to the President and a Presidentially appointed Science Advisory Committee.

William T. Golden designed the Presidential Science Advisory apparatus for President Truman in 1950. He is President of the New York Academy of Sciences. He has served in the US Navy (World War II), the Atomic Energy Commission, the Department of State, and the Executive Office of the President. He received the Distinguished Public Service Award of the National Science Foundation (1982). Mr. Golden is an officer and trustee of the American Association for the Advancement of Science, the American Museum of Natural History, the Mount Sinai Hospital and Medical School, and the Carnegie Institution of Washington; and a member of the National Academy of Public Administration and of the American Philosophical Society.

Mr. **Walgren**. Then let's turn to Dr. Buchsbaum.

Dr. **Buchsbaum**. Thank you, Mr. Chairman.

I do welcome this opportunity to contribute to these hearings. I'm assuming that I've been invited to do so not because of my position at AT&T Bell Laboratories but because of my long-term advisory role in the government.

Your purpose today is to inquire into the performance of the Office of Science and Technology Policy.

OSTP has the mandate to serve the immediate needs of the President and also help set long-range goals and policies for the entire, huge Federal enterprise in science and technology. So, the Director of OSTP is also the President's Science Adviser. So today I'd like to talk about both the Office of the Science Adviser and the OSTP, if I might.

My own experience in science advising at the White House level did not begin auspiciously. I got fired on my first assignment. That happened when I was serving on the President's Science Advisory Committee during President Nixon's first term. PSAC was disbanded by the President in the wake of the SST and ABM controversies.

Now, career counselors tell us that getting fired may be a good learning experience, and it was for me. The fate of PSAC taught me a lesson that the following years only reinforced, namely, the value of distinguishing between illusion and reality in science advising. Illusion may have its uses; but, if science advice is to serve the national interest, we must root it in the realities. And we must root it not just in the scientific realities but in the political realities as well.

In the course of its existence over many years, PSAC did perform great services to the country. But during the years I was there, it proved largely ineffective. We did enjoy terrific prestige in the scientific and technical communities. We issued reports. We were living an illusion, because neither the administration nor the agencies paid much attention. So little of lasting value emerged.

In retrospect, the reason was quite—is quite simple. For the most part, we set our own agenda, with the result that much of what we did was oblique to the purposes of the administration. And we enjoyed no rapport with either the administration or the agencies. The lack of rapport, as well as lack of discipline, caused PSAC to botch the two issues that were of burning interest to the then White House, namely, the ABM and the SST issues.

I believe that the situation today is much improved in large part because the work of OSTP is rooted in the realities. I'd like to take this opportunity to applaud the effectiveness of Dr. Graham and his present staff of OSTP.

In my written testimony, at the back of this conclusion, I cite several examples of OSTP's recent accomplishments, including its influence on the Federal budget for science and technology, which, as was mentioned earlier, is the ultimate test for reality of government's science and technology policy.

The OSTP has, in my view, been performing a vital job and doing it with skill. Could its performance be better? Yes, without doubt. The question is how.

Some people call for the resurrection of PSAC even though there is now a White House Science Council that does provide science advice to the President, albeit through a different mechanism that the old PSAC did.

The WHSC apparently doesn't satisfy some people. They want another PSAC that would have some of the trappings of old.

Unfortunately, an organization patterned on the old PSAC may, as I've tried to emphasize, tend to foster illusion at the expense of reality. Unless science advisers earn the confidence of those they advise, effective advice, advice that is needed, advice that is wanted, and most importantly, advice that is heeded is difficult, if not impossible.

The key ingredients are not all that obscure: they've got to be technically sound; to be forthright; have to be apolitical; you have to be discreet, if necessary; but, you don't kowtow.

To be effective, the present Science Adviser must work within the confines of a policy deliberation system in order to relay advice and counsel to the President, his Cabinet, his fellow advisers. As we know, as was said earlier, the President receives policy recommendations from a number of sources.

As Director of OSTP and as Science Adviser to the President, the present Science Adviser, I believe, Dr. Graham, is in a good position to be able to work actively within each of these forums that advise the President, either personally or through his staff, which participates in a discussion of those issues that have a scientific and technology aspect.

Any Science Adviser worth his salt has a two-part agenda: a part that's handed to him by the administration and a part of his own making which he deems both important and achievable within the existing political system.

I believe that Dr. Graham's role in such—is such that he operates fairly—quite effectively within the mechanisms of this administration on both parts of the agenda.

Everybody agrees, of course, that the effectiveness of the Science Adviser depends very much on his or her relationship with the President and that will never change. And many other things have changed; and, in thinking about science advice, we need to take them into account as well.

Science and technology have grown vastly more complex over the years. The knowledge base has grown enormously since the halcyon days of PSAC during the 1950's and 1960's, and that knowledge is diffused much more widely around the world—as was said here today. Many more questions hinge on science and technology. Not least, almost no issue can be reduced to a straightforward technical proposition any longer, such as getting a man on the Moon or closing a missile gap. And this is true whether the issue is nuclear power, air traffic control, energy independence, toxic waste disposal, fighting AIDS or cancer, shoring up our industrial competitiveness, or deciding about the Strategic Defense Initiative.

Today, every serious technical issue is caught up in non-technical cross-currents of every description—political, economic and social issues about which science advisers may be no more expert than anyone else. Science advisers can legitimately offer only one of several inputs to a process in which an administration's top policymakers and the Congress must act as the final arbiters.

In short, in my humble view, many critics are trying to fix what is not broken. OST's real problems lie elsewhere, as was said here this morning. As I said earlier, OSTP has the mandate to serve the immediate needs of the President and also set long-range goals and policies for the entire Federal enterprise in S&T. Either one is hard to do well. But long-range policy-setting is especially difficult when staffs and budgets are inadequate and when short-range demands keep growing at a furious pace.

I believe that OSTP has done a commendable job in handling the day-to-day issues of science advising. But it has not had the resources, as was stated innumerable times this morning, to address in depth and in breadth the long-range needs.

One of the most important tasks here is to help adjust Federal priorities in line with the march of scientific advance. The government has great difficulty adjusting to change and even greater difficulty spearheading change in the national interest.

In the past few years, OSTP has seen its budget and its staff cut by about a third. I believe this trend should be reversed, in support of the comments made by earlier witnesses. Because of budgetary pressures, most new staff has come from other sectors of the government, but almost none from the private sector. And given OSTP's mission, this is not a good situation.

In sum, I see no great weakness in the upper reaches of the OSTP organization. I do, however, see it in the lower and middle levels of the organization. And strengthening those levels would serve the Nation well.

Finally, Mr. Chairman, in your letter of invitation, you asked me to suggest legislative measures to improve OSTP effectiveness.

I believe that the present statutes are basically fine. They do enable OSTP to be as effective as it can be. After all, effectiveness cannot be mandated. However, there is one area where legislative clarification would be useful, and that is in the international arena. A clear definition that now exists of the respective roles of OSTP and the Department of State in international science and technology would be desirable.

There is now some overlap in the enabling legislation which occasionally leads to conflict as to who is to do what with regard to international science and technology.

Thank you, Mr. Chairman.

[The prepared statement of Dr. Buchsbaum follows:]

WRITTEN TESTIMONY

S. J. BUCHSBAUM

Executive Vice President

AT&T BELL LABORATORIES

TESTIMONY BEFORE THE COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY

U. S. HOUSE OF REPRESENTATIVES

HEARINGS ON THE OFFICE OF SCIENCE & TECHNOLOGY POLICY

FEBRUARY 17, 1988

I appreciate this opportunity to contribute to these hearings. I assume that I have been invited to testify today not because of my position at AT&T Bell Laboratories, but because of my long-term advisory role in the Government.*

Your purpose today is to inquire into the performance of the

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* I served on the President's Science Advisory Committee during President Nixon's first term. After that, I had the honor and pleasure to chair the Defense Science Board during President Ford's tenure and the Energy Research Advisory Board during President Carter's. I was also consultant to the Office of Science and Technology Policy (OSTP) during the Carter Administration and chaired several ad hoc advisory task forces for Dr. Frank Press, then the President's Science Advisor.

Since 1981, I have served as Chairman of the White House Science Council, first for Dr. George Keyworth and now for Dr. William Graham, both Science Advisors to President Reagan.

Office of Science & Technology Policy. OSTP has the mandate to serve the immediate needs of the President and also help set long-range goals and policies for the entire, huge Federal enterprise in science and technology. Thus, the Director of OSTP is also the President's Science Advisor. So today I would like to talk about both the Office of Science Advisor and the OSTP.

My own experience in science advising at the White House level did not begin auspiciously. I got fired on my very first assignment. That happened when I was serving on the President's Science Advisory Committee (PSAC) during President Nixon's first term. PSAC was disbanded by the President in the wake of the SST and ABM controversies.

Career counselors tell us that getting fired can be a major learning experience, and it was for me. The fate of PSAC taught me a lesson that the following years only re-enforced--namely, the value of distinguishing between illusion and reality in science advising. Illusion may have its uses, but if science advice is to serve the national interest, we must root it in the realities. And we must root it not just in the scientific realities, but in the political realities as well.

In the course of its existence, PSAC performed great services to the country. But during the years I was there, it proved largely ineffective. We enjoyed terrific prestige in the scientific and technical communities. We issued reports. But we were living an illusion, because neither the Administration nor the agencies paid much attention. So little of lasting value emerged.

In retrospect, the reason is quite simple. For the most part, we set our own agenda, with the result that much of what we did was oblique to the purposes of the Administration. And we enjoyed no rapport with either the Administration or the agencies. The lack of rapport, as well as a lack of discipline, caused PSAC to botch the two issues that were of burning interest to the White House--namely, the ABM and the SST issues.

The situation today is much improved in large part because the work of OSTP is rooted in the realities. I would like to take this opportunity to applaud the effectiveness of Dr. Graham and the present staff of OSTP. I cite just a few highlights of their work over the past year or so.

One of OSTP's chief functions is to coordinate Federal science and technology policy. In that capacity, OSTP sponsored development of a national aeronautics policy for the late 80's and beyond. Among other things, the activity culminated last year with the release of a report, entitled National Aeronautical R&D Goals. The report is likely to have wide influence. Another influential report was on the health and utilization of Government R&D laboratories.

Again in its role as coordinator, OSTP responded to important developments that have occurred recently in several fields of science, ranging from superconductivity to supercomputing. Among other things, OSTP strengthened the Federal Coordinating Council for Science, Engineering and Technology (FCCSET) by adding two new committees and restructuring others. In my view, this is a large step in the right direction. A strong FCCSET, headed by the Science Advisor, would be a constructive force in helping develop long-range science and technology policies.

OSTP has helped lead the Federal effort to deal with another important issue: technology transfer. Nearly everyone now recognizes that in international economic competition, technology is U.S. industry's ace in the hole. But although we excel in basic research and technology, we have often been slow to transfer basic research and technology into innovative products that are successful in the marketplace. In an effort to strengthen the innovation process, OSTP can take credit for the concept of promoting industry-university cooperation through Engineering Research Centers. The concept has won bipartisan support, and 13 of these centers have been established at universities around the country. The Presidential Young Investigator Program, another well-regarded program linking universities and industry and strengthening young faculty, resulted from OSTP initiative.

OSTP also played a key role in formulating and then implementing a new set of Administration initiatives for boosting our competitiveness. These were the initiatives announced in last year's State of the Union Address.

Internationally, OSTP brought more order this year to the process of creating bilateral agreements with other countries in science and technology. These agreements provide a useful tool for advancing the national interest, but only on the right terms. Intellectual property rights have been a particular concern, as they should be. On this and several other levels, OSTP has been heavily involved in negotiations with countries that include Japan, China, Korea, India and Brazil.

OSTP has also helped our Government use science and technology to forge more stable relationships with the Soviet Union and the Eastern Bloc nations. In particular, it performed well in developing positions for the last Reagan-Gorbachev Summit Meeting.

Finally, in defense matters, the OSTP has continued to play an important role. Inside the defense community, the level of scientific and technological expertise is very high. But OSTP provides a useful outside perspective. One example among many is the OSTP's successful effort to encourage the Defense Department to support more basic research.

Of course, the jury is still out on how effective all these initiatives will turn out to be. Clearly, some will turn out to have more lasting value than others.

I need not emphasize here that a key measure of OSTP's effectiveness lies in its ability to help shape the Federal budget for science and technology. As we all know, in Washington budgets are the reality test for policy. So we can measure OSTP's influence by the degree to which our science and technology budgets reflect the Government policies and priorities. As one important example, OSTP has worked hard for increased support for basic science. It is no accident that the NSF budget is over 70% larger today than it was seven years ago.

By that and other standards, too, the OSTP has in my view been performing a vital job, and doing it with skill. Could its performance be better? Yes, without doubt. But how?

Some call for the resurrection of PSAC even though there is now a White House Science Council, WHSC, that provides science advice to the President, albeit through different mechanisms than the old PSAC did. The WHSC apparently does not satisfy some people. They want another PSAC that would have all the trappings of old.

Unfortunately, an organization patterned on the old PSAC may, as I have tried to emphasize, tend to foster illusion at the expense of reality. Unless science advisors earn the confidence of those they advise, effective advice - advice that is needed, is wanted and is heeded - is difficult if not impossible. The key ingredients are not all that obscure: be technically sound, be forthright, be apolitical and be discreet, if necessary, but don't kowtow.

To be effective, the Science Advisor must work within the confines of a policy deliberation system in order to relay advice and counsel to the President, his Cabinet, and his fellow advisers. As we all know the President receives policy recommendations from a number of sources -- the Economic Policy Council, the Domestic Policy Council, the National Security Council, the Cabinet, the Office of Management and Budget, and a variety of other interagency working groups.

As Director of OSTP and as Science Advisor to the President, Dr. Graham is in the unique position of being able to work actively within each of these forums either personally or through his staff which participates in the discussions of those issues that have a scientific and technology aspect. A good science advisor has a two-part agenda: a part handed to him by the Administration and a part of his own making which he deems both important and achievable within the existing political system. I know from my experience and discussions that Dr. Graham's role is such that he operates very effectively within the mechanisms of the Administration on both parts of the agenda.

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Everyone agrees, of course, that the effectiveness of the Science Advisor depends very much on his or her relationship to the President. That will never change. But many other things have changed, and in thinking about science advice, we need to take them into account, too.

Science and technology have grown vastly more complex. The knowledge-base has grown enormously since the halcyon days of PSAC during the 50's and 60's, and that knowledge is diffused more widely around the world. Many more questions hinge on science and technology. Not least, almost no issue can be reduced to a straightforward technical proposition any longer--such as getting a man on the moon, or closing a missile gap. This is true whether the issue is nuclear power, air traffic control, energy independence, toxic waste disposal, fighting AIDS or cancer, shoring up our industrial competitiveness, or deciding about the Strategic Defense Initiative.

Today, every serious technical issue is caught up in non-technical cross-currents of every description--political, economic and social issues about which science advisors may be no more expert than anyone else. Science advisors can legitimately offer only one of several inputs to a process in which an administration's top policy makers must act as the final arbiters.

In short, many critics are in my view trying to fix what is not broken. OSTP's real problems lie elsewhere. As I said earlier, OSTP has the mandate to serve the immediate needs of the President and also to help set long-range goals and policies for the entire, huge Federal enterprise in science and technology. Either one is hard to do well. But long-range policy setting is especially difficult when staffs and budgets are inadequate, and when short-range demands keep growing at a furious pace.

OSTP has done a commendable job in handling the day-to-day issues of science advising. It has also tackled several issues of long-term impact, such as the health of our universities, the effectiveness of government laboratories, an effective framework for the work of OECD and the US world competitiveness. But it has not had the resources to address in depth and in breadth the long-term needs. One of the most important tasks here is to help adjust Federal priorities in line with the march of scientific advance. After World War I, chemistry was the queen of the sciences. After World War II, it was physics. Today, it is computing and biotechnology. The outlook changes constantly, but the Government has great difficulty adjusting to such change, and even greater difficulty spearheading change in the national interest.

In the past few years, OSTP has seen its budget and its staff cut by about one-third. To improve OSTP's performance, that trend should be reversed. Because of budgetary pressures, most new staff has come from other sectors of the Government, with almost none from the private sector. Given OSTP's mission, that is not a good situation.

In sum, I see no great weakness in the upper reaches of the OSTP organization. I do, however, see it in the lower and middle levels of the organization. Strengthening those levels would serve the nation well.

Mr. Walgren. Thank you, Dr. Buchsbaum.

And then Dr. Bugliarello.

Dr. Bugliarello. Mr. Chairman, I am grateful for this opportunity to contribute to the—to these hearings.

I am president of Polytechnic University in New York, as well as chairman of the Committee on Science, Engineering and Public Policy of the American Association for the Advancement of Science. I am also founder and editor of Technology in Society, which is a journal that over the past 10 years has focused on the issues that involve technology in our society. So I speak, obviously, from a very different viewpoint that many of those who had preceded on this panel and who have been directly engaged in the process of science advising to the President.

Because of the multiplicity of entities to provide policy advice to the President, it is difficult to single out the performance of a single entity such as OSTP. Keeping this caveat in mind, it can be said that the complex of White House mechanisms has undoubtedly been effective in the current Administration in providing a high level of support for science and technology.

On the other hand, the OSTP has not yet addressed—other than this article—is some very fundamental and long-range issues in our society that have to do with science and technology and are crucial to our future.

Identification of these long-range issues and the recognition of the policy and institutional implications should by themselves be the subject of a major White House study and become part of a global vision of the future of our Nation, to guide the long-term policies of future Presidents.

Failing that, a list of such issues is, of course, a very subjective exercise. However, a number of long-range concerns that are already sufficiently evident today to deserve attention. Let me mention just a few by the way of example. I will stress more truly broad issues rather than those that are more purely technical, simply because we have greater difficulties in addressing these issues.

One issue is the emergence or re-emergence of global centers of technological and commercial power, such as Japan, China and a more united Western Europe. Most of the scientific and sociotechnological issues confronting us, such as manufacturing competitiveness, defense, how to develop big science, the use of space, the wise management of the environment, or how to best assist developing countries, that are affected by our interdependence with these centers of powers.

We also need to assess the implications of the emergence of three great world cities—New York, Tokyo and London—as mega centers of power in finance and of user—and as users and producers of information and to develop policies to enable us to respond and take advantage of this phenomenon.

The second example is the technological causes and consequences of trends in the internal development of our country. For example, we need to address in a fundamental and farsighted way the infrastructure implications of the geographical shifts of our population, the role of technology in reducing the intolerable high costs and inadequacies of health care, and in making possible a more effective delivery of education, as well as the implications for technological development and competitiveness of the changes in demography, education, socioeconomic status and values of our population. Above all, we need to address the potential role of technology in an all-out attack on the problem of poverty.

Another example is the question of long-range science investment plans. We need to address the question of the long-term future of our basic science capabilities and develop long-term objectives and priorities that would maintain science viable. This includes the question of how to best conduct big science and of the interaction among various elements of science—universities, national laboratories, industrial laboratories.

A particular aspect of this issue, of course, that requires enlightened long-term policies is that of science and technology in the universities. We have always looked at universities as producers of science and technology to be mobilized in response to our national needs.

Today, we're looking again at the universities for help, this time to address the problem of industrial competitiveness. However, the universities have deteriorated in their laboratory facilities and in their appeal to students of science and, above all, to students of engineering.

The facts are well-known. The point is that the issue of long-term science investment must be addressed vigorously, with a broad strategic plan to draw the maximum effectiveness from the considerable resources that on the aggregate are invested in our universities and our national and industrial laboratories. Otherwise, there will be more and more interventions forced by Congress on the Executive, as well as actions at the State or local level that may be suboptimal from a national viewpoint, ultimately squandering precious national resources. But we may continue to witness Federal actions that ignore the needs and the resources in science and technology of States and regions.

Thus, a crucial element of a long-range science and technology investment policy must also be the harmonizing of Federal science policy with State and local science policies.

The last example that I would like to make is that of the safeguard necessary to ensure the long-range physical survival of a society like ours which is on a technological limb. We are vitally dependent on technology to carry out the most fundamental, vital functions of our everyday life. Also, we are linked globally by technology, making serious epidemics like AIDS an immediate global concern.

Thus, we need policies not only to establish early warning systems and plans for action but also to insure redundancies in the case of the malfunction of key technological links—such as in energy or food or information systems.

The current inadequacies in addressing with the necessary depth problems such as these in the White House stems from a variety of factors, of which a very obvious one is the limited strength of the OSTP as it is now conceived and staffed.

The ability of our Nation to address these long-term science and technology issues must reside in the first place in the skill and the commitment of the White House. Thus, it is important to rethink the rationale, the mandate, the resources and the modus operandi of OSTP as a key element in enabling the White House to exert the necessary long-range leadership.

As a guide to what we could do, allow me to consider a few basic propositions.

The first and obviously—the President must be free to get advice from whatever source he or she chooses.

The second is that, however, the President must have at his disposal advice based on a solid base of facts and analysis. And that base cannot be gathered exclusively by an ad hoc presidential adviser or ad hoc committees, but requires also a substantial dedicated organism with no vested interest.

There is a need, in other words, for such an organism within the White House, whether it is called OSTP or something else.

The third point is that the mechanism of science and technology advice to the President must go beyond factfinding and analysis and address some of the crucial issues in our future, such as some of those that I have suggested, that involve science and technology.

Now, clearly, the addressing of these issues cannot be forced on the President. However, the President's ability to address these issues will be greatly weakened if there is not an OSTP-like mechanism in the White House with the ability to identify, with a vision to propose scenarios, and with the skill to indicate to the President possible policy options.

To better enable OSTP to carry out its functions, it may be desirable to separate it from the Science Adviser. The separation would underscore the fact that the functions of the two mechanisms are not identical, but basically complementary—although both, of course, appointed by the President.

The Science Adviser must respond to the political needs of the President. And experience shows that only those advisers have been truly successful who became part of the inner circle of the White House.

On the other hand, the OSTP contribution can be effective in the measure that it is perceived as not being politicized. Thus, the formulation of policies should emerge from the constructive interaction of these two complementary agencies: the OSTP and the Science Adviser.

Another point is that the OSTP needs also to have power and competency. It needs a first-class staff, appreciably larger than is the case today. To the structure, its appointments, OSTP should also have a longer time constant to the Presidential term because the basic time constants of science and technology are often longer. For instance, it takes some 30 or 40 years before universities can change significant directions.

Last, the issue of accountability. In the future, the establishment of consensus as to the strategic directions of science and technology will become so important as to demand—as to demand some direct form of accountability to the Nation by the science advice mechanism in the White House. Obviously, OSTP must be accountable to the President, and its advice must remain confidential. However, at an appropriate time after the fact, OSTP should make public the rationale of its analysis and policy option recommendation.

In conclusion, Mr. Chairman, the fact is that we have reached a stage in the course of our Nation in which science and technology have become the most powerful determinant of our future. And as constituted today, the OSTP must be regarded simply too limited to assist the President in dealing with the immense complexities with which science and technology are bound to confront him in the future. Thus, OSTP must be greatly strengthened and provide it with a broader mandate.

Thank you.

[The prepared statement of Dr. Bugliarello follows:]

Statement of

George Bugliarello
President
Polytechnic University

before the

Subcommittee on Science Research and Technology
Committee on Science and Technology
U.S. House of Representatives

February 17, 1988

Chairman Walgreen, Distinguished Members of the Subcommittee,

I am grateful for the opportunity to contribute to the oversight hearings on the Office of Science and Technology Policy (OSTP). My name is George Bugliarello. I am President of Polytechnic University in New York, as well as Chairman of the Committee on Science, Engineering and Public Policy (COSEPP) of the AAAS and Chairman of the Mayor's Committee on Science and Technology in New York City. I am also founder and editor, with George Schillinger, of Technology in Society, a journal that over the past ten years has focused on the multifaceted issues that involve technology in our society, including the question of science advice to the President. Given this background, my views on OSTP, and, more generally, on the science and technology advising apparatus in the White House, come from a different perspective than the views of those who have been directly engaged in the process. I hope that they may be of some usefulness in these hearings just because of this different perspective.

SCIENCE AND TECHNOLOGY IN OUR SOCIETY AND ADVICE TO THE PRESIDENT

Science and technology is a new force that was not greatly evident in the political concerns of our nation at the time of the signing of the Constitution, even though underlying the Constitution were some fundamental concepts, such as that of checks and balances, that have a scientific analogy. Since the signing of the Constitution, science and technology have become in our country a force that, taken together with our form of government, constitutes the most distinctive characteristic and the greatest strength of our nation. It is also a force that presents us with very fundamental issues and dilemmas. For instance, science is democratic in the sense that it cannot be subject to the principle of authority. This parallels and reinforces our political democracy. However, the democracy of science is of a different nature than the democracy of the political process, because a scientific fact is not determined by the opinions or the wishes of a majority. At the same time, the application of science requires in our society a consensus, creating a constant and, if properly channeled, constructive tension between the absolute of a scientific truth and the necessary expediency of the political process. Science and technology, furthermore, by offering us ever increasing opportunities for trade-offs between biological processes, social processes and technology, also create new and difficult dilemmas. For instance, in the case of contraception, should we rely on more biological process - the control of biological rhythms - on social pressures, or on machines or artifacts - that is contraceptives or abortions? Or, in the pursuit of space exploration or in the development of new factories, to what extent should we rely on automation versus human operators?

Science and technology extend enormously our biological and social reach. However, the viability of that extension has not been subject to the crucible of biological evolution. This forces us to be very careful as to how we proceed in committing our society to a given technological course. In terms, specifically, of the subject of this hearing, we may thus end up by viewing as beneficial the numerous changes that have occurred over the years in the mechanisms and theories of science advice to the President. In virtue of their experimental and generally not very revolutionary nature, these changes have not committed us to courses of action that, if more drastic, could have had dangerous unforeseen consequences. We have, all told, followed a middle of the road approach, maintaining, even in the advice to the President in matters of science and technology, a system of checks and balances - if nothing else because of the changes brought about by presidential successions.

The question is, fully accepting and preserving the virtues of this system of checks and balances, can we move more boldly in the effective utilization of science and technology to serve our national goals? Can we avoid doing so at a moment when throughout the globe science and technology have become the most significant determinant of the power of nations, besides geography and demography? Nations - and regions within nations - prosper or decay because of science and technology, making the direction of science and technology one of the most crucial elements of any national policy.

In our country, the recognition of this fact is only imperfectly articulated and acted upon at this moment. It is submerged by other concerns that are more immediately in the minds of the voters and therefore of the political leadership, even if it is widely recognized that our capabilities in science and technology underly our competitiveness, our military power and our way of life.

THE EMERGENCE OF SCIENCE AND TECHNOLOGY ADVISING MECHANISM

The Civil War showed clearly, perhaps for the first time, the immense significance of science and technology as an element of national power. In the second half of the last century this recognition led to the birth of scientific bodies such as the National Academy of Sciences, with advisory responsibilities to the government. But it was truly only with World War I that a very major mobilization of our scientific and technological effort took place and that the issue arose of how to effectively provide advice to the government in the use of science and technology. The creation of the National Research Council, albeit in a form different from what it is today, is of that period.

The need for science and technology advice to the highest level of government - to the President - became particularly pressing, as we well know, in World War II, and led to mechanisms and functions that are the forerunners of those that exist today.

The marked turbulence of the past fifteen years concerning these mechanisms is perhaps an inevitable response to the recognition of the all-pervasive influence of science and technology in every sphere of government action, and of the difficulties of focusing it synergistically through neatly compartimentalized government departments and agencies.

THE OSTP TODAY

The specific issue of the effectiveness today of the Office of Science and Technology Policy (OSTP) cannot be discussed without considering the fact that other elements also are involved in formulating science and technology policies and in providing systematic advice, directly or mediately, to the President such as the Science Advisor in a function separate from when he acts as Director of the OSTP, the White House Science Council, the Federal Coordinating Council on Science, Engineering and Technology (FCCSET), the Office of Management and Budget (OMB), the National Science Board, as well as government departments and agencies.

Because of this multiplicity of entities providing policy advice, it is difficult to single out the performance of a single entity such as OSTP. Keeping this caveat in mind, it can be said that the complex of White House mechanisms has been undoubtedly effective in the current administration in providing a high level of support for science and technology. The NSF has been given higher budgets to enable it to initiate the program of research centers, and three large scale projects, the Superconducting Super Collider (SSC), the Strategic Defense Initiative, and the space station have been pushed.

On the other hand, the mechanisms of White House science advice have not succeeded in generating consensus within the scientific community - let alone among the population at large - as to the thrust of some of these programs: Neither have they - and specifically OSTP - been able to address other than episodically or with limited depth some very fundamental and long-range problems of our society that have to do with science and technology and are crucial to our future.

THE NEED TO ADDRESS FUNDAMENTAL LONG-RANGE ISSUES

The identification of what these long-range issues may be, and the recognition of their profound policy and institutional implications should by themselves be the subject of major White House studies and become part of a global vision of the future of our nation, to guide the policies of future Presidents. What a list of such issues may encompass is, of course, a very subjective exercise, bound also to change as our perspective changes because of advances in science and technology, of other developments in our society, and because of changes in the geo-political situation. Indeed, such issues will change from presidency to presidency, so that the process must be a dynamic one of constant reassessment.

However, a number of long range concerns are sufficiently evident today to suggest the need right now to develop basic understandings and to begin to consider appropriate long-term policies. Without being all inclusive, let me suggest a few, random examples of these concerns. I shall focus not on purely scientific or technical issues, but on issues including a very complex interaction of science or technology with other key aspects of our society, and thus demanding the integration of views and approaches that only the White House can provide:

The emergence or reemergence of global centers of technological and commercial power, such as Japan, China and a more united Western Europe, and their implications for the U.S. Most of the scientific and socio-technological issues confronting us, such as manufacturing competitiveness, defense, how to develop big science, the use of space, the wise management of the environment, or how to best assist developing countries, are affected by our interdependence with these centers of power. We also need to assess the implications of the emergence of great world cities - such as New York, Tokyo and London - as mega-centers of power in finance and of the production and use of information - and to develop policies to enable us to respond to this phenomenon.

The policies toward developing countries. With their burgeoning populations, needs and debts, many of these countries are becoming an ever increasing element of world concern. They desperately need science and technology to break the vicious circles of poverty, ignorance and excessive susceptibility to national disasters. Our policies must address the question as to how to better utilize, in the assistance of these countries, our scientific and technological strength, rather than continuing to rely on brute force aid. The policies must also be able to better take into account global interdependence, and avoid, in the future, a repetition of mistakes such as having encouraged some countries in the direction of an accelerated fuel dependency that has compounded their economic struggle.

The technological causes and consequences of trends in the internal development of our own country. For example, we need to address in a fundamental and farsighted way the infrastructure implications of the geographical shifts of our population, the role of technology in reducing the intolerable high costs and inadequacies of health care and in making possible a more effective delivery of education, as well as the implications for technological development and competitiveness of the changes in demography, education, socio-economic status and values of our population. Above all, we need to address the potential role of technology in an all-out attack on the problem of poverty.

Long-range science investment plans. We need to address the question of the long-term future of our basic science capabilities, and develop long-term objectives and priorities that would maintain the viability of science. This includes the questions of how to best conduct big science, of the interaction among various elements of science - universities, national laboratories, industrial laboratories - and of the support of unpopular yet important disciplines such as civil engineering.

A particular aspect of this issue that requires enlightened long-term policies is that of science and technology in the universities. Universities are of course a key resource for science and technology in our country, but they are also an increasingly thin resource that has been buffeted by changes in government policy. We have always looked at universities as bountiful producers of science and technology to be mobilized in response to our national needs. The universities have indeed responded, even at the risk, occasionally, of compromising their long-range soundness. This process started with World War I and was greatly enhanced during World War II and in the post-Sputnik area. Today, we are looking again at universities for help, this time to address the problem of industrial competitiveness. However, the universities have deteriorated in their laboratory facilities and in their appeal to students of science and engineering. The loss of engineering students, which are the foundation of our technological prowess, is particularly critical. It stems from many factors, key among them not only the perceived desirability of other careers - notably in business and finance - but also, and above all, the alarmingly low level of science and technology literacy in our nation.

The facts are well-known, so that it is not the place here to go into detail. The point is that the issue of long-term science investments needs to be addressed vigorously, with a broad strategic plan to draw the maximum effectiveness from the considerable resources that on the aggregate are invested in our universities and our national and industrial laboratories. Otherwise, we will witness more and more interventions forced by Congress on the Executive, as well as actions at the state or local level that may be suboptional from a national viewpoint, ultimately squandering precious national resources. Or, vice versa, we may continue to witness, as it is actually much more frequently the case, federal actions that ignore the needs and the resources in science and technology of states and regions. Thus, a crucial element of a long-range science and technology investment policy must also be the harmonizing of federal science policy with state and local science policies.

The industrial, military and diplomatic implications of the "age of transparency". Commercial observation satellites can make available to anyone - military adversaries, commercial competitors, terrorists, the media and the public in general - information about force deployments, traffic, crops, industrial inventories, and so on. This example of how science and technology can impact on long established patterns will force us to reassess how to carry out diplomacy, counterterrorism, military operations and trade in a "transparent" information environment - just as nuclear weapons forced a fundamental reassessment of foreign policy and the conduct of war.

The safeguards necessary to insure the long-range physical survival of a society like ours which is on a "technological limb". We are vitally dependent on technology to carry out the most fundamental vital functions of our everyday life - we are indeed no more purely biological entities but, rather, artifacts. Also we are linked globally by technology, making serious epidemics like AIDS an immediate global concern. Thus we need policies not only to establish early warning systems and plans for action, but also to insure redundancies in the case of the malfunction of key technological links - such as in energy, food or information systems.

A particular long-range issue that such policies need to address is that of a global environment which itself, because of technology, is becoming more and more an artifact. Through technology, we are burning many biological bridges behind us while creating new possibilities on earth and in space. This process demands the attention of the Chief Executive of a technological country like ours that is a major contributor to it.

RETHINKING OSTP

The current inadequacies in addressing with the necessary depth - if at all - problems such as these in the White House stem from a variety of factors, of which a very obvious one is the limited strength of OSTP as it is now conceived and staffed. In all fairness, it would be difficult to expect more under the circumstances. The ability, however, of our nation to address long-term science and technology issues must reside in the first place in the skill and commitment of the White House. Thus it is important to rethink the rationale, mandate, resources and modus operandi of OSTP as a key element of science and technology advice in the White House - a key element in enabling the White House to exert the necessary long-range leadership.

SUGGESTIONS FOR THE FUTURE

How could, then, the ability of the White House be strengthened to deal with truly long-range major issues in science and technology policy, as well as with the myriad of shorter-range ones that, in political terms, are of more direct and immediate concern to the President and his (or her) staff? To address this question, it may be useful to progress through a few basic propositions, some of them self-evident:

1) The President must be free to get advice from whatever source he chooses. The way the President gets advice should be, of course, the President's prerogative.

2) However, the President must have at his disposal advice based on a solid base of facts and analysis. That base cannot be gathered exclusively by an ad hoc presidential advisor or an ad hoc committee, but requires also a substantial dedicated organism with no vested interests. There is a need for such an organism within the White House, whether it is called OSTP - as I shall continue to do for the sake of brevity - or something else. The key point is that such an organism must work with the highest degree of professionalism and competence, and earn the respect of the community by establishing a track record.

3) Science and technology advice to the President depends vitally also on two other elements: the input from the various department and agencies involved in science and technology, and the ability to tap the scientific and technical community at large through an appropriate mechanism, whether it be called PSAC or the White House Science Council. Thus OSTP must have the self-confidence to hold its own in reacting to the recommendations of other agencies, and at the same time the ability to coordinate inputs and actions across the federal government and to take maximum advantage of outside advice.

4) The role that science and technology plays in the White House obviously depends on the orientation, vision and commitment of the President. It is fair to believe that future Presidents will see ever more the centrality of science and technology to the ability of our country to

maintain its democratic ideals and its role in the world into the next century and beyond. For this reason, the mechanism of science and technology advice to the President must go beyond fact finding and analysis, but be able to address some of the crucial issues in our future that are shaped by science and technology or that involve science and technology - identify them, proposing policies and coordinating solutions at the pleasure of the President. Clearly the addressing of these issues cannot be foisted on a President. The President will have to determine, either by cool, analytical judgment or by intuitive feeling, their significance to his mandate as Chief Executive of our country, as well as to his political future. However, the President's ability to address these issues will be greatly weakened if there is not a mechanism in the White House with the ability to identify them, the vision to propose scenarios, and the skill to indicate to the President possible policy options.

5) As our dependence on science and technology in all facets of our lives and of our government becomes increasingly critical, the moment will come for the nation - if it has not already - to make it mandatory for the President to centrally address questions of science and technology as a determinant of our future, rather than subsuming them under the headings of foreign policy, economic policy, defense and so on.

6) An important consideration concerning the role of an OSTP-like organization in the White House has to do with what can be called the time constants for the entitites involved. The time constants of science and technology often are much longer than presidential terms or the span of tenure of cabinet officers or of heads of government agencies who change with the President. For instance, it takes some thirty or forty years before universities can change significant directions, simply because this

is the time constant of change in their faculty. Or, it may take well over a decade for scientific advances to reach the level of practicality. Thus, there is a need for a government mechanism dealing with science and technology policy, that has a longer time constant than the presidential term. However, that mechanism, unlike the judiciary, cannot be made independent of the President, because science and technology are not an element of the government system of checks and balances, but very much a hands-on instrument of presidential power. Continuation beyond the presidency obviously cannot be provided by the Science Advisor, although undoubtedly a responsible Science Advisor, like a responsible President, will be profoundly concerned by the long-range impact of presidential actions. It must be provided by a separate mechanism, such as the one that in short I have continued to call OSTP. The ability to respond to longer time constants will depend, within that mechanism, on a balance of short- and long-term appointments, although the latter should not by any means resemble automatic civil service tenure.

7) Another important consideration in contemplating the functions of OSTP is one of accountability. Obviously a science advising mechanism in the White House must be accountable to the President, and, through him, to the Congress and the nation. But, in the future, the establishment of consensus as to the strategic directions of science and technology will become so important as to demand some direct form of accountability to the nation by the science advice mechanism in the White House. Advice to the President by such a mechanism must remain confidential, as it would lose all of its effectiveness if conducted in the public arena. However, it is important that, at an appropriate time after the fact and in a unclassified

way, OSTP make public the rationale of its analyses, the basis of fact from which they flowed, the scenarios it constructed and the nature of the policy options it submitted to the President.

8) To better enable OSTP to carry out its function, it may be desirable to separate it from the Science Advisor. Although both appointments, the Science Advisor and the Director of the OSTP, need to be made by the President, the separation would underscore the fact the functions of these two mechanisms are not identical, but basically complementary. The Science Advisor must respond to the political needs of the President in the area of science and technology, but with as much scientific objectivity and commitment to science and technology as possible. Experience shows that only those advisors have been truly successful, who became part of the inner circle of the White House.

On the other hand, the OSTP contributions in carrying out the broad statutory functions assigned by Public law 94-282 to OSTP, as well as the additional functions envisioned here, can be effective in the measure that they are not politicized. Thus the formulation of policies should emerge from the constructive interaction of these two complementary agencies, the OSTP and the Science Advisor, complemented by direct and systematic advisory inputs by high caliber scientists and technologists.

9) To carry out its mandate, the OSTP must have power and competency. It needs a first-class staff, appreciably larger than is the case now. This requires time to build it, and cannot be achieved if the staff changes substantially every four years. The ability to attract a strong staff depends also on the perception of the influence of OSTP. The current perception is that unlike the case of OMB, OSTP is not "where the action

is". This is bound to limit the effectiveness of the vitally important collaboration between OSTP and OMB - a vicious circle that must be broken.

SUMMARY

We have reached a stage in the course of our nation in which science and technology have become the most powerful determinant of our future. As such, it is a vital concern to the nation that the President have available in the White House a mechanism immune from the vested interest of the other agencies throughout the government that use science and technology, and capable of providing the President not only with data, analyses, policy options and coordination for the problems of today and of the near future, but also with a long-range view of what science and technology can mean to the long-term future of the country. Clearly, the President will get his advice from whatever sources he may choose. However, science and technology are too important for the country not to press on the President the need to consider it as a key element of his stewardship of state.

As constituted today, the OSTP must be regarded as simply too limited to deal with the immense complexities with which science and technology are bound to confront our chief policymaker in the future. It must be greatly strengthened, and provided with a broader mandate.

Mr. **Walgren**. Thank you very much.

Dr. Leavitt.

Dr. **Leavitt**. Thank you, Mr. Chairman, for the opportunity to present a point of view influenced by a career in industrial research with the Dow Chemical Co., plus 1 year at OSTP in 1987 as an Industrial Research Institute Fellow.

From my point of view, as noted earlier, science and technology in this country has not been a political issue of major significance up until now. But for several decades, we've enjoyed the luxury of the fruits of a magnificent science apparatus without needing to really agonize over how to best fund, manage, or utilize this asset.

Obviously, to me, that era has ended. The task at hand includes new variables. Funds are limited. Industry is not investing in basic research at the relative spending levels of a few years ago. Young people are becoming less motivated to choose careers in science or engineering.

And many of the challenges come not from limits on science, but rather from the unlimited potential capabilities our international competitors have to develop activities based on science that we may have produced ourselves.

Numerous mega projects are now evident in all sciences. How do we balance funding a big science versus a small science? It seems to me, therefore, science and technology must now be a political issue. It's unavoidable.

In 1976, when Congress created the Office of Science and Technology Policy, the world was less complex. Science and technology policy is now an issue which is too significant to ask one modest-sized group of dedicated technical people to effectively develop, lead and evaluate results therefrom without improvements in its support system.

Let's consider several possible approaches to strengthening the Office with emphasis on what an incoming administration and Congress can jointly achieve.

First, science and technology must be put on the national policy agenda. The White House must hear from all of us—singly and collectively—that this Nation leads—needs leadership—in government's science and technology efforts. Leadership can only be maintained by authority and, thus, a Cabinet-level representative for science and technology is required. This should be the President's Science Adviser.

Having established this Oval Office connection, the Science Adviser should create and chair a science and technology coordinating group. Representatives could include: Assistant Secretary levels from all agencies with major science and technology programs; the Office of Management and Budget and General Accounting Office; and the Academies of Science and Engineering and the Institute of Medicine.

This policy group, with a Presidential mandate, could take responsibility for several of the following initiatives. And I'll read some—some that I will—some I will not read and I'll include in the written record:

Develop and implement an interagency mechanism for prioritizing mega projects amongst themselves and versus small science.

Carry a message to Congress, Federal agencies, industry, universities, and perhaps most importantly, the public, that puts into perspective the realities of today's world in terms of science and technology and industrial competitiveness. Perhaps we need a White House Competitiveness Council.

Continue efforts to facilitate movement of know-how from Federal laboratories to U.S. industry. Develop a mechanism for evaluating the response agency by agency. Methodology to make appropriate positive responses could become the norm.

Work within the administration to obtain adequate budget support for OSTP to enhance resources and add adequate staff skills to carry out this critical mandate.

Collaborate with all sectors—States, Congress, Department of Education, industry, and academia—to find solutions to the pressing educational problems facing the United States and, indeed, the science and technology community.

With the Department of State, negotiate science and technology agreements with other nations designed to provide multination funding for large science or technology programs that exceed single nation capabilities. Strengthen intellectual property laws, and open two-way flow of science and technology with foreign nations.

With assistance from all agencies, develop and implement a regulatory procedure in a timely manner to allow American industry to effectively compete in these new technologies. Example: biotechnology.

The timing of this hear—that this hearing is indeed appropriate to develop input for the next administration. However, many of the suggestions contained in today's testimony from all witnesses should be tested and/or run on a pilot scale yet this year.

Mr. Chairman, I applaud your subcommittee's interest in this subject. Thanks for the opportunity to comment.

[The prepared statement of Dr. Leavitt follows:]

STATEMENT OF FREDERICK C. LEAVITT
BEFORE THE
HOUSE OF REPRESENTATIVES SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
HEARING ON OVERSIGHT OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY
FEBRUARY 17, 1988

THANK YOU, MR. CHAIRMAN, FOR THE OPPORTUNITY TO PRESENT A POINT OF VIEW INFLUENCED BY A CAREER IN INDUSTRIAL RESEARCH, PLUS ONE YEAR AT OSTP IN 1987 AS AN INDUSTRIAL RESEARCH INSTITUTE FELLOW.

ASIDE FROM A FEW MEGA PROJECTS (E.G. SPACE, WAR ON CANCER), SCIENCE AND TECHNOLOGY (S&T) IN THIS COUNTRY HAS NOT BEEN A POLITICAL ISSUE OF MAJOR SIGNIFICANCE. FOR SEVERAL DECADES, WE HAVE HAD THE LUXURY OF ENJOYING THE FRUITS OF A MAGNIFICENT SCIENCE APPARATUS WITHOUT NEEDING TO AGONIZE OVER HOW TO BEST FUND, MANAGE AND UTILIZE THIS ASSET.

THAT ERA HAS ENDED. NEW CHALLENGES CONFRONTING THE NATION ARE NOW BECOMING EVIDENT. THE TASK AT HAND IS IMMENSE, URGENT AND INCLUDES VARIABLES WE HAVE NOT DEALT WITH BEFORE. FEDERAL GOVERNMENT FUNDS FOR RESEARCH AND DEVELOPMENT THAT IMPACT DIRECTLY ON OUR INDUSTRIAL COMPETITIVENESS ARE SEVERELY LIMITED. INDUSTRY IS NOT INVESTING IN BASIC RESEARCH AT THE RELATIVE SPENDING LEVELS OF A FEW YEARS AGO. OUR YOUNG PEOPLE ARE BECOMING LESS MOTIVATED TO CHOOSE CAREERS IN SCIENCE OR ENGINEERING.

MANY OF THE NEW CHALLENGES COME NOT FROM LIMITS ON SCIENCE AND TECHNOLOGY, BUT RATHER FROM THE UNLIMITED POTENTIAL CAPABILITIES OF ALL INTERNATIONAL COMPETITORS TO DEVELOP ECONOMIC ADVANTAGES BASED ON SCIENCE AND TECHNOLOGY.

ANOTHER ISSUE RELATED TO THE EXTRAORDINARY SCIENTIFIC POSSIBILITIES NOW OPEN TO EXPLORATION IS HOW TO PRIORITIZE GIANT PROJECTS. NUMEROUS MEGA PROJECTS ARE NOW EVIDENT IN NEARLY ALL SCIENCES (I.E. THE SUPERCONDUCTING SUPER COLLIDER, SEQUENCING THE HUMAN GENOME, SPACE STATION, ETC.). ALSO, HOW DO WE BALANCE FUNDING OF BIG SCIENCE VS. SMALL SCIENCE?

IN SHORT, THE WORLD IN 1976, WHEN CONGRESS CREATED THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY, WAS MARKEDLY LESS COMPLEX. SCIENCE AND TECHNOLOGY POLICY IS NOW AN ISSUE WHICH IS TOO SIGNIFICANT TO ASK ONE MODEST-SIZED GROUP OF DEDICATED TECHNICAL PEOPLE TO EFFECTIVELY DEVELOP, LEAD AND EVALUATE RESULTS THEREFROM WITHOUT IMPROVEMENTS IN ITS SUPPORT SYSTEM.

LET'S CONSIDER SEVERAL POSSIBLE APPROACHES TO STRENGTHENING THE OFFICE WITH EMPHASIS ON WHAT AN INCOMING ADMINISTRATION AND CONGRESS CAN JOINTLY ACHIEVE.

FIRST, S&T MUST BE PUT ON THE NATIONAL POLICY AGENDA. THE WHITE HOUSE MUST HEAR FROM ALL OF US, SINGLY AND COLLECTIVELY, THAT THIS NATION NEEDS LEADERSHIP IN GOVERNMENT'S S&T EFFORTS. LEADERSHIP CAN ONLY BE MAINTAINED BY AUTHORITY AND, THUS, A CABINET-LEVEL REPRESENTATIVE FOR S&T IS REQUIRED. THIS SHOULD BE THE PRESIDENT'S SCIENCE ADVISOR.

HAVING ESTABLISHED THIS OVAL OFFICE CONNECTION, THE SCIENCE ADVISOR SHOULD CREATE AND CHAIR A SCIENCE AND TECHNOLOGY COORDINATING GROUP. REPRESENTATIVES WOULD INCLUDE 1) ASSISTANT SECRETARY LEVELS FROM ALL AGENCIES WITH MAJOR SCIENCE AND TECHNOLOGY PROGRAMS 2) OFFICE OF MANAGEMENT AND BUDGET AND GENERAL ACCOUNTING OFFICE AND 3) THE ACADEMIES OF SCIENCE AND ENGINEERING AND INSTITUTE OF MEDICINE.

THIS POLICY GROUP, WITH A PRESIDENTIAL MANDATE, SHOULD TAKE RESPONSIBILITY FOR THE FOLLOWING INITIATIVES:

1) PROMOTE AND PROTECT AN INCREASED AND PREDICTABLE BUDGET FOR BASIC RESEARCH.

2) DEVELOP AND IMPLEMENT AN INTERAGENCY MECHANISM FOR PRIORITIZING MEGA PROJECTS--AMONGST THEMSELVES AND VERSUS SMALL SCIENCE

3) CARRY A MESSAGE TO CONGRESS, FEDERAL AGENCIES, INDUSTRY, UNIVERSITIES AND THE PUBLIC THAT PUTS IN PERSPECTIVE THE REALITIES OF TODAY'S WORLD IN TERMS OF S&T AND INDUSTRIAL COMPETITIVENESS. PERHAPS WE NEED A WHITE HOUSE COMPETITIVENESS COUNCIL.

4) CONTINUE EFFORTS TO FACILITATE MOVEMENT OF KNOW-HOW FROM FEDERAL LABORATORIES TO U.S. INDUSTRY. DEVELOP 1) A MECHANISM FOR EVALUATING THE RESPONSE AGENCY BY AGENCY AND 2) METHODOLOGY TO MAKE APPROPRIATE POSITIVE RESPONSES THE NORM.

5) ESTABLISH A JOINT OMB/OSTP R&D BUDGETARY REVIEW PROCESS. THE SCIENCE ADVISOR SHOULD CARRY THE RESULTS AND RECOMMENDATIONS DIRECTLY TO CONGRESS WITH THE APPROVAL OF THE WHITE HOUSE.

6) WORK WITHIN THE ADMINISTRATION TO OBTAIN ADEQUATE BUDGET SUPPORT FOR OSTP TO ENHANCE RESOURCES AND ADD ADEQUATE STAFF SKILL TO CARRY OUT THIS CRITICAL MANDATE. CONSIDER RELATIVELY LOW COST CONSOLIDATIONS OF TALENT (E.G. MOVE THE OFFICE OF PRODUCTIVITY, TECHNOLOGY AND INNOVATION FROM COMMERCE TO OSTP).

7) COLLABORATE WITH ALL SECTORS--STATES, CONGRESS, DEPARTMENT OF EDUCATION, INDUSTRY AND ACADEMIA--TO FIND SOLUTIONS TO THE PRESSING EDUCATIONAL PROBLEMS FACING THE U.S. S&T COMMUNITY.

8) WITH ASSISTANCE OF THE DEPARTMENT OF STATE, NEGOTIATE S&T AGREEMENTS WITH OTHER NATIONS DESIGNED TO:

   1) PROVIDE MULTI-NATIONS FUNDING FOR LARGE SCIENCE OR TECHNOLOGY PROGRAMS THAT EXCEED SINGLE NATIONS CAPABILITIES

   2) STRENGTHEN INTELLECTUAL PROPERTY LAWS AND

   3) OPEN TWO-WAY FLOW OF S&T WITH FOREIGN NATIONS.

9) WITH ASSISTANCE FROM ALL AGENCIES, DEVELOP AND IMPLEMENT A REGULATORY PROCEDURE IN A TIMELY MANNER TO ALLOW AMERICAN INDUSTRY TO EFFECTIVELY COMPETE IN NEW TECHNOLOGIES (E.G. BIOTECHNOLOGY).

10) WORK WITH THE CONGRESS TO PASS LEGISLATION TO

   A) STRENGTHEN PATENT LAWS

   B) ALLOW ADDITIONAL MODES OF INDUSTRY COLLABORATION TO ENHANCE COMPETITIVENESS

C) PROVIDE ECONOMIC INCENTIVES TO ENCOURAGE INDUSTRIAL RESEARCH AND DEVELOPMENT IN THE U.S. AND

D) SEEK OTHER INNOVATIVE APPROACHES TO THE CHALLENGE OF U.S. COMPETITIVENESS IN THE 1990'S.

THE TIMING OF THIS HEARING IS INDEED APPROPRIATE TO DEVELOP INPUT FOR THE NEXT ADMINISTRATION. HOWEVER, MANY OF THE SUGGESTIONS CONTAINED IN TODAY'S TESTIMONY SHOULD BE TESTED AND/OR RUN ON A PILOT SCALE YET THIS YEAR.

MR. CHAIRMAN, I APPLAUD YOUR SUBCOMMITTEE'S INTEREST IN THIS SUBJECT. THANK YOU FOR THE OPPORTUNITY TO COMMENT.

Mr. **Walgren**. Well, thank you very much, all of you, for that testimony.

Mr. Golden, would you like to make any other direct points? I think, I—I was shorter with you than others, and I apologize for that.

Mr. **Golden**. Well, thank you for your generosity. I think, rather than—than make some remarks that I was going to, I'll put them in the written record. But I would like to make, if I may have just a few minutes, a few points that perhaps worthy of making very briefly. And they're largely repetitive, although some are not.

First, it's essential, I think, in—in creating a useful flow of science and technology information into the government at the top level—and I'm not talking about the departmental levels where it's also very important—but at the top level, in the executive branch, especially, we're talking about—the President must be interested. That's the first ingredient.

If he isn't interested, there's going to be a limping relationship, perfunctory—it'll be better than nothing, but not much better. He doesn't have to agree with his advisers. Indeed, they have to—have to expect not to be agreed with always, and they must recognize the importance of political elements along with scientific and technological elements.

If the President is interested, then a trusted and intimate relationship can develop, and that would be the ideal. And perhaps the model would be the Killian/Eisenhower relationship. And they had not known each other before Dr. Killian—Mr. Killian, rather—was recommended by Dr. Rabi, who had been—was acting as chairman of that PSAC body—that body at that time. So that would be the objective we hope for.

I would like, to partly address attention, to quote a very famous character in the classical world, namely, Bucephalus, was the famous favorite horse of Alexander the Great—and ascribed to him was the statement back in 300-odd B.C.: You can lead a horse to water but you cannot make him drink. And that, I think, is applicable to this question of—of an inflow of science and technology advice to the President.

I think—another point—I think, as others have said, the organization chart level is very important. We all know it in many walks of life, especially in bureaucracies—and I don't mean that as a pejorative, but as a descriptive term—large, complex organizations—the rank one has, whether it be in the military or in the civilian organizations—are quite important. They are not the only important thing.

But the—the question of whether the President's Science Adviser should report to him directly, as originally was done, or should do so through the White House staff is, I think, crucial. And it—in—in the terms that a former ham radio operator might use: It's a question of whether the ohms are too great and the voltage too small. And the resistance that is met by going through organizational channels reduces whatever voltage and influence, therefore, to—the Science Adviser might have.

I have heard remarks to the contrary, but I think that they are not correct. So I think the stature of the Science Adviser is important for two reasons:

One, the—his ability to deal with the rest of the government organization and, secondly, the ability to attract to that office a man or woman of stature, scope, self-assurance, and the requisite qualities that I have—I won't have to detail at this time—namely, stature within the scientific community, the degree of respect and recognition elsewhere. And although that also has been denied by some, I think it is a crucial point.

And history, as all of you know who have been following this, shows that many very capable—a very considerable number of capable scientists and quasi-scientists have declined the office because its level on the chart or position on the totem pole was too low, and the impedance was too great in getting to the top.

Mr. **Walgren**. I think——

Mr. **Golden**. Finally——

Mr. **Walgren**. Oh, all right, go ahead, one more point. They're going to ring some bells on me here at 2 o'clock and——

Mr. **Golden**. Well, I'll just finally, I wanted both to applaud and express gratification at the subcommittee hearings which are calling attention to this subject. Not only they call—your studying them, and you will resolve your own thoughts—but they're calling attention to the subject in the outside world. And that, I think, is crucial. I hope that that attention will be expanded.

I will just relate here what some other organizations have done and are doing to that end, which are completely symbiotic with what you are doing. But you are at a level which will give a credibility that could not be achieved otherwise.

Just recently—there was last week—the all-day session at the AAAS annual meeting on this subject, which attracted, as I said, very considerable attention.

Another item is, one of the most respected, oldest, and wealthiest of the private foundations is very seriously considering this matter and is planning to establish a commission of very distinguished people, which may run for several years, to—what shall I say—to further efforts to raise the level of science and technology advising in the government—all facets of it—especially in the executive branch, but not ignoring State levels as well.

That will be announced in the near future. I'm not at liberty to mention the name of the foundation, but you will all know it and respect it. I think it's important.

Secondly, the University of California at San Diego has scheduled a colloquium, again with very well qualified people. It will be held at the end of March on this subject under the leadership of Richard Atkinson, the Chancellor, who has been Director of the National Science Foundation, as you know, and is president-elect of the American Association for the Advancement of Science.

Finally, the AAAS aspired to this annual meeting event of last week, did send telegrams to all of the Presidential candidates—inviting them to appear, or to send statements, or to send representatives. A very few of them did. I think it was Mr. Nagle—I'm not sure—who decried the lack of interest by the candidates. And the candidates will need some stimulation, I think, to put this higher on their list of priorities, and perhaps the attention of this committee will help to do that.

And finally, the Federation of American Scientists—which I am not affiliated but which I am very familiar with, and has been a very active agency—has also written to and attempted to stimulate all candidates to submit statements. And, indeed, they did get a few statements from a few candidates at that AAAS meeting. I believe that the FAS, as it's called, is going to continue its efforts and will surely be stimulated by the actions of this Committee.

Thank you very much.

Mr. WALGREN. Thank you all.

I guess it's a—a tough year out there, but obviously there's lots of parts of the private sector that are interested in this and that will certainly be helpful.

What's it like to go for 1 year to an organization like this, Dr. Leavitt? [Laughter.]

Apparently we're functioning in some way on detailees, and I wonder if you have anything——

Dr. LEAVITT. That could be the subject of an after dinner address.

Mr. WALGREN. I should ask the question more sharply.

Is it—can you be useful, and can an agency function largely on the contributions of somebody who is there for a short period of time?

Dr. LEAVITT. Well, I think from my comments, I don't disagree with the—the other witnesses this morning, which says the Office is, I think, understaffed. You tend to address short range, fire fighting issues and, indeed, therefore, you are useful. You are swept up in the vacuum. I mean, it's just a frenetic affair—and so you do a lot of things. You bring a perspective of your background.

As was stated earlier, I think industry—that's what industry is all about. I mean, that's the driving force for the Nation. If we're worried about science policy, why are we worried? It's to drive our industry so we can compete in the world. And they—they are very receptive, very responsible, very impressive talent in the Office.

But, indeed, it's not only the Fellows who come and go—it's the detailees. So that there's no institutional memory, which I think is a shame. That's been alluded to many times. What the solutions are—what's tough to tell. When you're in that maelstrom of activity, you aren't thinking about solutions—just surviving.

Mr. WALGREN. Well said.

Well, you've worn me out so I think we'd probably best should bring it to a close. [Laughter.]

I want to say that we do appreciate all the effort that went into making your presentations to the Committee and to the record. And we want unanimous consent to hold the—the record open for members and others to submit written statements. And without objection, that will be ordered.

[The prepared opening statement of Mr. Lujan follows:]

HON. MANUEL LUJAN, JR. (R-NM)
OPENING STATEMENT
HEARING ON
THE OVERSIGHT OF THE OFFICE OF SCIENCE & TECHNOLOGY POLICY
SUBCOMMITTEE ON SCIENCE, RESEARCH AND TECHNOLOGY
FEBRUARY 17, 1988

IN LOOKING OVER THE WITNESS LIST FOR TODAY'S HEARING AND READING THE WRITTEN TESTIMONY PROVIDED, I AM STRUCK BY THE UNUSUAL OPPORTUNITY THIS COMMITTEE HAS TO CONDUCT AN OVERSIGHT ON THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY (OSTP). IT IS VERY RARE TO BE ABLE TO ASSEMBLE PEOPLE WITH FIRST HAND EXPERIENCE SPANNING FIVE DIFFERENT ADMINISTRATIONS AND WHO HAVE DEALT WITH AS MANY DIVERSE AND COMPLICATED SCIENTIFIC AND POLITICAL EXPERIENCES AS OUR WITNESSES TODAY. WE REGRET THAT SCHEDULING CONFLICTS HAVE INTERFERED WITH THE APPEARANCE OF SOME OF OUR WITNESSES. HOWEVER, I WOULD RECOMMENED THAT THE SUBCOMMITTEE KEEP OPEN THE RECORD FOR ADDITIONAL COMMENTS.

TODAY'S HEARING CAN BE AS MUCH A BENEFIT TO THE CONGRESS AS TO THE EXECUTIVE BRANCH AND THE U.S. SCIENTIFIC ENTERPRISE. IT IS AN OPPORTUNITY AFTER 12 YEARS OF PASSAGE OF P.L. 94-282 TO STEP BACK AND EXAMINE THE CONTRIBUTION OF THE OSTP AND THE VALUE OF LEGISLATION WHICH CREATED IT. THAT IS NOT TO SAY WE SHOULD NOT LOOK BACK TO THE

YEARS OF THE FIRST SCIENCE ADVISORS AND CONTEMPLATE ON WHAT IT IS THAT MAKES THE POSITION AN EFFECTIVE SOURCE OF ADVICE AND COUNSEL TO THE PRESIDENT OF THE UNITED STATES. I VIEW THIS HEARING TODAY AS AN "OPPORTUNITY TO AIR THE ROOM OUT", SORT OF A SPRING CLEANING. LET'S KEEP WHAT IS GOOD AND IDENTIFY WHAT IS OUTDATED OR NO LONGER NECESSARY. AS MANY WITNESSES HAVE NOTED, IT IS SIGNIFICANT TO HOLD HEARINGS IN THE EVE OF THE NEXT ADMINISTRATION. THE ROLE THAT SCIENCE AND TECHNOLOGY POLICY PLAYS IN OUR OVERALL NATIONAL STRATEGY SUPERCEDES THE IMPORTANCE OF ANY SINGULAR SCIENCE POLICY ISSUE. IT IS NOT SUFFICIENT TO HAVE A SPACE POLICY, AN ENERGY POLICY, OR AN EDUCATION POLICY INDEPENDENT FROM AN OVERALL SENSE OF DIRECTION FOR A SCIENCE AND TECHNOLOGY STRATEGY FOR THE UNITED STATES.

I EXTEND MY APPRECIATION TO THE WITNESSES TODAY FOR THEIR FORTHRIGHT COMMENTS. IT IS CURIOUS TO ME THAT THERE ARE JUST A FEW CONSISTENT THEMES THROUGHOUT TODAY'S TESTIMONY. WHILE MANY HAVE CHOSEN TO COMMENT ON SIMILAR TOPICS, THEIR POINT OF VIEWS, AND THE ANGLES WITH WHICH THEY ATTACK THESE ISSUES VARY. TO ME THIS IS A SIGN OF A VERY WELL CONSTRUCTED OVERSIGHT EXERCISE. IT IS ESSENTIAL TO RECEIVE POINTS OF VIEW, BASED ON FIRSTHAND EXPERIENCE, FROM A NUMBER OF DIFFERENT INDIVIDUALS. IF I WERE TO PINPOINT THE ONE PREDOMINANT THEME FROM OUR WITNESSES IT WOULD BE THE EXPECTATIONS CONGRESS HAS OF OSTP. IT APPEARS THAT MANY WITNESSES BELIEVE CONGRESS EXPECTS TOO MUCH FROM THIS OFFICE. ANOTHER COMMON THREAD IS THE DIFFICULTY EVEN THIS OFFICE HAS WITH LONG-TERM PLANNING.

THIS IS OF CONCERN TO US IN CONGRESS, WHO ARE NOT KNOWN FOR

LONG-TERM PLANNING EITHER. YET, PERHAPS THIS IS A POLITICAL REALITY WE NEED TO EXPLORE TODAY. WHAT CAN BE DONE TO FACILITATE LONG-TERM PLANNING OF NATIONAL SCIENCE AND TECHNOLOGY POLICY?

THERE ARE OTHER ISSUES, VERY IMPORTANT ONES WHICH OUR WITNESSES WILL BRING UP TODAY:

QUESTIONS OF THE STAFFING OF OSTP; SUCH AS HOW LARGE OR SMALL SHOULD IT BE? SHOULD IT BE A COMBINATION OF PERMANENT AND TEMPORARY STAFF?

IS THERE VALUE OF DETAILEES IN THE CORPORATE MEMORY WHICH THE CIVIL SERVICE SYSTEM CARRIES FROM ADMINISTRATION TO THE NEXT?

WHAT IS THE RELATIONSHIP OF THE PRESIDENT'S SCIENCE ADVISOR TO THE SECRETARY OF EDUCATION, PARTICULARLY IN FORMULATING A NATIONAL EDUCATION STRATEGY FOR THE U.S.? WHAT IS HIS OR HER RELATIONSHIP TO THE SECRETARY OF STATE, PARTICULARLY THROUGH THE NEGOTIATION OF SCIENCE AND TECHNOLOGY AGREEMENTS AND EXCHANGES WITH FOREIGN NATIONS?

WHAT IS TO BE SAID FOR THE RELATIONSHIP OF THE DIRECTOR OF OSTP TO THE SECRETARY OF DEFENSE?

HOW ACTIVE IS THE SCIENCE ADVISOR OR SHOULD THE SCIENCE ADVISOR BE IN DELIBERATION OVER THE OVERALL BALANCE OF THE FEDERAL BUDGET, PARTICULARY IN THE PERCENTAGE DEVOTED TO SCIENCE AND TECHNOLOGY AND

EDUCATION IN LIGHT OF ALL OTHER NATIONAL PRIORITIES?

WHAT ROLE DOES THE PRESIDENT'S SCIENCE ADVISOR PLAY IN CONTINUED SUPPORT OF NATIONAL FACILITIES, WHETHER THEY BE NATIONAL ASTRONOMY OBSERVATORIES, OR OUR FEDERAL LABS?

WHAT ROLE DOES OUR SCIENCE ADVISOR PLAY ALONG WITH THE HEADS OF AGENCIES IN THE DETERMINATION OF WHETHER OR NOT THE FEDERAL GOVERNMENT SHOULD SUPPORT THE CONSTRUCTION OF NEW LARGE FACILITIES?

MR CHAIRMAN, I WOULD CLOSE BY NOTING THAT EACH OF OUR WITNESSES HAVE POINTED TO THE IMPORTANCE OF THE PERSONALITY AND THE CHEMISTRY NECESSARY IN A PRESIDENTIAL SCIENCE ADVISOR. CERTAINLY THESE CHARACTERISTICS CAN NEVER BE REFLECTED IN LEGISLATION, HOWEVER, IT IS IMPORTANT FOR THIS COMMITTEE TO UNDERSTAND AND APRECIATE WHAT IS THE FRAMEWORK FOR MAKING THE PRESIDENT'S SCIENCE ADVISOR A STRONG CONFIDANT OF THE PRESIDENT AND A STRONG VOICE FOR NATIONAL SCIENCE POLICY.

THANK YOU.

Mr. **Walgren**. Thank you very much.

[Whereupon, at 2:05 p.m., the subcommittee was adjourned.]

APPENDIX I

ROBERT A. ROE, New Jersey, CHAIRMAN

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PAUL E. KANJORSKI, Pennsylvania
GEORGE J. HOCHBRUECKNER, New York

U.S. HOUSE OF REPRESENTATIVES
COMMITTEE ON SCIENCE, SPACE, AND TECHNOLOGY
SUITE 2321 RAYBURN HOUSE OFFICE BUILDING
WASHINGTON, DC 20515
(202) 225-6371

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HAROLD P. HANSON
Executive Director
ROBERT C. KETCHAM
General Counsel
R. THOMAS WEIMER
Republican Staff Director

February 23, 1988

Dr. William R. Graham, Director
Office of Science and Technology Policy
Executive Office of the President
Washington, D.C. 20500

Dear Dr. Graham:

Thank you for your appearance before the Subcommittee on Science, Research and Technology at the recent hearing on OSTP. Your testimony is a valuable contribution to assisting the Subcommittee in its oversight responsibilities.

One concern touched upon by several witnesses at the hearing was that OSTP is too lightly staffed and that too many of the staff are detailees from other federal agencies. In order to have a complete record on this point, I would appreciate receiving a current roster for OSTP which indicates permanent full-time employees, part-time employees, and detailees. Also, would you please provide a tabulation of the numbers of professional staff in the following categories by year starting in 1977: permanent full-time, part-time, detailee, and associate director (indicate whether or not confirmed by the Senate).

Again, I appreciate your contribution to our hearing and thank you for your attention to my request for additional information.

Sincerely,

Doug Walgren

DOUG WALGREN, Chairman
Subcommittee on Science,
Research and Technology

DW/Wll

EXECUTIVE OFFICE OF THE PRESIDENT
OFFICE OF SCIENCE AND TECHNOLOGY POLICY
WASHINGTON, D.C. 20506

June 1, 1988

Dear Dr. Wilson:

This in response to Congressman Walgren's letter of February 23 regarding information concerning permanent full-time employees, part-time employees, detailees and associate directors of the Office of Science and Technology Policy (OSTP) during the period 1977 to present.

Attached you will find the requested information. I have also provided a list of individuals on the OSTP staff and their type of assignment.

If I may of further assistance do not hesitate to contact my office, (202) 456-6272.

Sincerely,

Jonathan F. Thompson
Executive Director

Attachments

Dr. James D. Wilson
Science Consultant
House Subcommittee on Science,
  Research and Technology
RHOB Room 2319
Washington, D. C. 20515-6305

OFFICE OF SCIENCE AND TECHNOLOGY POLICY

ROSTER

Science Advisor to the President and Director	Dr. William R. Graham (F)
Deputy Director	Dr. Thomas P. Rona (F)
Executive Director	Jonathan F. Thompson (D)
Assistant Director(s)	Dr. Beverly J. Berger (D) Michael B. Marks (D) Deborah L. Wince (D) Michelle K. Van Cleave (F)
Special Assistant(s)	Dr. Alan B. Chambers (D) Robert L. Post (D) Barbara J. Diering (F)
Military Assistant(s)	Dr. R. Joseph DeSutter (D) LtCol Thomas J. Bishop (D)
Director of Public Affairs	Mary Catherine English (D)
Senior Policy Analyst(s)	Dr. Janet V. Dorigan (D) Dr. Frances C. Li (D) LtCol John F. O'Neil (D)
Public Affairs Assistant	Sally Sherman (F)
Receptionist	L. Michaelle Gordoni (F)
Secretaries	Nancy Clark (F) Ruth A. Fisher (F) Roseanne Hill (F) Joan Hunerwadel (D) Jonina L. Lance (D) Marian J. Nida (F) Elsie Patterson (F)

F - Full-time Permanent Staff (11)
D - Detailee (14)

OFFICE OF SCIENCE AND TECHNOLOGY POLICY

ASSOCIATE DIRECTORS

INDIVIDUALS NOT CONFIRMED BY THE SENATE

	FROM	TO
Benjamin Huberman	7/13/79	8/9/81
Gilbert Omenn	7/13/79	3/29/80
Philip M. Smith	7/13/79	1/18/81

INDIVIDUALS CONFIRMED BY THE SENATE

	FROM	TO
Ronald B. Frankum	8/20/82	10/1/83
Bernadine Healy	7/22/84	9/27/85
John P. McTague	7/22/84	5/23/86
Thomas P. Rona	11/23/87	Present

OFFICE OF SCIENCE AND TECHNOLOGY POLICY

PERSONNEL

	FULL-TIME PERMANENT		PART-TIME/TEMPORARY		DETAILEES	
	PROFESSIONAL	SUPPORT	PROFESSIONAL	SUPPORT	PROFESSIONAL	SUPPORT
1977	11	11	0	0	10	0
1978	11	12	0	0	8	0
1979	11	12	0	0	10	0
1980	12	12	2	5	10	0
1981	7	5	3	4	10	0
1982	6	5	3	4	7	3
1983	5	6	2	6	17	11
1984	6	6	2	4	15	11
1985	4	6	2	4	15	9
1986	4	5	0	3	15	7
1987	4	5	0	1	16	6
1988	4	7	0	0	12	2

APPENDIX II

ADDITIONAL STATEMENTS FOR THE RECORD

IEEE WASHINGTON OFFICE
THE INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS, INC.
1111 19th STREET, N.W. WASHINGTON, DC 20036-3690, U.S.A. TELEPHONE (202) 785-0017

January 28, 1988

Committee on Science, Space & Technology
Subcommittee on Science, Research &
Technology
2319 Rayburn House Office Building
Washington, DC 20515

Dear Sirs:

The Subcommittee on Science, Research & Technology is planning a hearing on Oversight of the Office of Science & Technology Policy on February 17, 1988. In connection with that hearing, I would like to submit for your consideration a recent entity position which was developed by my Committee on U. S. Competitiveness on the subject of Strengthening the Office of Science & Technology Policy.

Sincerely

Bruno O. Weinschel, Chairman
Committee on U.S. Competitiveness

BOW:cm
Enclosure
cc: Edward C. Bertnolli
William R. Tackaberry
William G. Herrold

ENTITY POSITION STATEMENT

STRENGTHENING THE OFFICE OF SCIENCE & TECHNOLOGY POLICY

[illegible] and [illegible] Engineers, Inc.
1111 19th STREET, N.W. WASHINGTON, DC 20036-3690
(202) 785-0017

One important leg of U.S. competitiveness is the development, dissemination and utilization of technology. The solution of our competitiveness problem requires proper policies for the direction of technology development, its utilization and the development of the appropriate knowledge base and skills of the workforce. These tools can assist industrial management to concentrate on quality and how to satisfy the needs of the end user while being cost competitive. This will be an important step towards increasing the U.S. living standards.

Within the Executive Branch is the OSTP (Office of Science and Technology Policy) in the Executive Office of the President. We have an immediate opportunity to forge a sharper focus for science and technology policy by strengthening the staff and stature of OSTP and its access to the President. This can be accomplished within its existing authority by greater Administration initiative and Congressional oversight. If need arises, additional authority can be legislated. A strong OSTP can advise the President about priorities for government funded R&D while being fully cognizant of privately funded U.S. academic and industrial R&D as well as all important non-U.S. R&D.

Industry-financed research, executed at industrial laboratories is broadly targeted while academic basic research is usually untargeted. The reduction to practice of the results of research is quicker for targeted research.

U.S. competitiveness has not suffered nearly as much from a lack of results of basic research, as from a lack of ability to utilize the fruits of basic research as efficiently as our trading partners in West Germany and the Pacific Rim countries have done. We must balance the proportion of untargeted to targeted research.

-over-

Approved CABayless
Carleton A. Bayless
Vice President-Professional Activities 12/4/87

Committee on U.S. Competitiveness	11/24/87
Approving Entity	**Date**

The infrastructure of manufacturing must be supported. The educational focus of our tertiary schools in engineering must be refocused on all the elements of international competitiveness. While continuing to teach, and to discover through research fundamental principles of science and technology, engineering colleges also need to draw examples from and teach concepts in technologies relevant to manufacturing processes important to U.S. international competitiveness.

President Reagan's Commission on Competitiveness, chaired by John Young, recommended in its final report in December, 1986 that a new department for science and technology be established at the Cabinet level. This proposal, however, may be subject to long debate. Our immediate alternative is to strengthen OSTP. Thus, the President will have the means to play a strong leadership role in improving our industrial base.

COUNCIL OF SCIENTIFIC SOCIETY PRESIDENTS

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American Nuclear Society
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Gerry G. Meisels
American Society for Mass Spectrometry and Allied Topics
Barbara H. Iglewski
American Society for Microbiology
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Jane Abbott
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Shirley Frye
National Council of Teachers of Mathematics
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Charles William Gear
Society for Industrial and Applied Mathematics
Robert T. Belly
Society for Industrial Microbiology
Richard W. Tsien
Society of General Physiologists
John M. Dealy
Society of Rheology

February 10, 1988

The Honorable Doug Walgren
Chairman
Subcommittee on Science, Research
and Technology
Committee on Science, Space and
Technology
U.S. House of Representatives
Washington, D.C. 20515

Dear Mr. Chairman:

In regard to the hearings planned (for February 17, 1988) by your Subcommittee on the Office of Science and Technology Policy (OSTP), I am writing to convey some related observations and recommendations of the Executive Board of the Council of Scientific Society Presidents (CSSP). Specifically, we recommend:

1. That the position of Science Advisor to the President and Director of the Office of Science and Technology Policy be made a Cabinet position;

2. That additional resources be made available to the OSTP (Emphasis here is placed on staffing requirements.); and

3. That the organization be charged with responsibility for soliciting the views and concerns of the scientific community on pertinent topics and that resulting information be conveyed to the President in a timely fashion.

The CSSP Executive Board recognizes that these recommendations might fall outside the sphere of your Subcommittee's jurisdiction.

The CSSP (which is made up of the presidents and other senior officers of 36 scientific societies with a cumulative membership of more than 850,000 spanning the mathematical, physical, and life sciences) has been pleased with the close and cordial relations enjoyed with several generations of Science Advisor to the President. The current Science Advisor and OSTP Director, Dr. Graham, and his staff have been particularly accessible and helpful to the CSSP on matters of national science policy, international technology transfer, information policy, intellectual property rights, science and technology risk assessment and management, biotechnology, and others.

1155 16th St., N.W., Washington, D.C. 20036 (202) 872-4452

The views expressed by CSSP are those of its members and do not necessarily represent the official position of their respective organizations.

The OSTP is viewed by our organization as an information resource as well as a science ombudsman, bridging disciplinary and governmental boundaries to reconcile differences, identify continuities, and interpret policies. We believe that the OSTP is most effective in these interfacial areas among, for example, federal agencies with jurisdiction in a particular area (e.g., quantifying health risks to the public); among nations engaged in scientific dialogue and exchange; among public and private research organizations; among federal, state and local governmental entities pursuing advances in science and their applications; between the scientific community and the public, including the media, financial, and industrial sectors, as well as the general public (on issues of public understanding/perception of science, commercial opportunities in science and technology, science education, science ethics, etc.); and even among scientific disciplines. Regarding the international arena, we believe that the OSTP is capable of coordinating the preparation and implementation of bilateral agreements in science and technology.

While we would not endorse a move to transform the OSTP into the structure and size of a major agency, the Executive Board believes that the Office has insufficient resources to carry out the useful coordination and catalytic activities outlined in the previous paragraph.

Among the steps we would recommend to rectify this situation, the most significant is to make the Science Advisor a Cabinet position. The important advantages of such a shift would be: more immediate, direct access to the President; ability to interact on a par with other Cabinet officials; ability to influence more substantively the size and shape of the science budget; and an enhanced ability to attract highly qualified candidates to the position of Science Advisor.

We also recommend that steps be taken to mitigate the present problem of under-staffing at the OSTP. We observe that, because of staff and resource limitations, the OSTP is inappropriately constrained in several of the significant interfacial questions noted above (for example, intellectual property rights in the context of U.S. technology transfer and trade policy; or the relationship between federal and state governments in identifying and stimulating the development of promising science-based enterprise; or the lack of uniformity in the computation and communication of risk associated with science and technology).

One approach to address this deficiency would be to require every federal agency conducting programs in the science/technology realm (Energy, Environment, Defense, Commerce, Interior, State, Agriculture, Education, Science Foundation, Health and Human Services, Transportation, Housing and Urban Development, etc.) each to provide without reimbursement one or two staff members to serve in the Office of Science and Technology Policy for a period of 1 to 2 years. Moreover, this program should be an augmentation or supplement to existing mechanisms which currently bring individuals into the Office from federal and other sectors.

A further recommendation to strengthen the dialogue with the White House is to continue the present spirit of openness that characterizes the OSTP and expand the opportunities for contact and interchange through the conduct of regular meetings to identify and examine current issues relating to science, mathematics, and technology within and across disciplinary boundaries.

Mr. Chairman, the steps outlined above would do much to boost the presence and effectiveness of the President's Science Advisor and OSTP Director in critical questions pertaining to the course and content of science and technology policy--without significant additional burden on the federal budget. Increasingly, science and technology will figure as a determinant of our national stature, strength, and security; we need voice above jurisdictional boundaries, parochial concerns, and political pressure to help shape that relationship. That should be the voice of the Science Advisor and the Director, Office of Science and Technology Policy.

I would welcome the opportunity to respond to any questions or comments you might have regarding the observations and recommendations set forth above.

Sincerely,

Stephen S Willoughby

Stephen S. Willoughby

cc: Mr. Robert A. Roe,
Chairman, Committee on Science, Space and Technology
Mr. Manuel Lujan,
Ranking Minority Member, Committee on Science, Space and Technology
Members, Subcommittee on Science, Research and Technology
Dr. William Graham,
Science Advisor to the President
CSSP Executive Board

F.A.S.

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*Nobel laureates

February 26, 1988

Honorable Doug Walgren, Chairman
Subcommittee on Science, Research, and Technology
Committee on Science, Space, and Technology
U. S. House of Representatives (2319 RHOB)
Washington, D. C. 20515

Dear Mr. Chairman:

As I discussed with Dr. James Wilson of your staff, enclosed is a Statement on Presidential Science Advice for inclusion in the Hearing Record of February 17th.

Thank you for your consideration of these views.

Sincerely,

Ellis R. Mottur

Ellis R. Mottur
Senior Adviser on
Science/Technology Policy

Enclosure

National Council Members (Elected)

*Julius Axelrod
Bruce Blair
Deborah L. Bleviss
Rosemary A. Chalk
Thomas B. Cochran
E. William Colglazier
Hugh E. DeWitt
John Harte
*Dudley R. Herschbach
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Victor Rabinowitch
Carl E. Sagan
Stephen H. Schneider
Andrew M. Sessler
George S. Stanford
Robert A. Weinberg

Ex Officio: John P. Holdren, Frank von Hippel

STATEMENT OF ELLIS R. MOTTUR
SENIOR ADVISER ON SCIENCE/TECHNOLOGY POLICY
FEDERATION OF AMERICAN SCIENTISTS

to the

Subcommittee on Science, Research, and Technology
Committee on Science, Space, and Technology
U.S. House of Representatives

February 17, 1988

PRESIDENTIAL SCIENCE ADVICE

The National Science and Technology Policy, Organization, and Priorities Act of 1976 (P.L. 94-282) was enacted in order to strengthen science advice to the President on matters of critical national concern. Yet in the nearly twelve years since its enactment, the role of the Science Adviser to the President has progressively declined both in impact on national policy formation and in perceived prestige within the scientific and professional communities. Therefore the Subcommittee on Science, Research, and Technology is to be commended for its oversight hearings on the Office of Science and Technology Policy (OSTP) and its efforts to enhance the status and effectiveness of that office.

The Federation of American Scientists (FAS), which was founded in 1945 by Manhattan Project scientists, has had a longstanding interest in science/technology policy. Thus in 1974, FAS was instrumental in convening a key meeting between the Council of Scientific Society Presidents and then Vice President Gerald Ford, which provided the chief impetus for Senate passage of S. 32 that year, which in turn served as the nucleus for subsequent enactment of the 1976 Act. As the principal Senate staff aide involved in the drafting and passage of that legislation -- as well as the first Assistant Director of the Office of Technology Assessment (OTA) -- I have recently been retained by FAS to advise on science/technology policy issues.

This statement to the Subcommittee will serve as the basis for a subsequent FAS policy position on Presidential Science Advice, after it has received appropriate review within the Federation. Since the deadline for submission for the hearing record did not permit time for that review, the Subcommittee should consider the views expressed in this statement as solely those of the author.

OSTP was created in 1976 in response to the widespread recognition that presidential decision making required the highest caliber of scientific and technical advice on a host of major issues, from defense and space to health care, environmental quality, and economic growth. This need was convincingly demonstrated through extensive testimony over several years of Congressional consideration, and was ratified by a 362 to 28 vote in the House of Representatives and a unanimous voice vote in the Senate.

Yet as clear as the need for Presidential Science Advice was in 1976, it is even more compelling and critical today. Military systems and arms control techologies have become even more sophisticated and complex; health care more demanding; environmental degredation more dangerous; and America's international competitive position more precarious. Success in these and other key areas depends in large measure on the excellence and ingenuity of our scientific and technical enterprise.

Put succinctly, science and technology significantly impinge on virtually every area of national and international policy. If top-quality science advice is not imparted at the highest levels of decision making early in the process, then the President must traverse the nation's policy-space with one of his chief engines disabled. Thus science/technology factors have become every bit as essential to the Chief Executive's deliberations as are economic and national security considerations; and his need for reliable, timely, expert advice in this area is equally important.

To upgrade the role of the Science Adviser to what will be required in the 1990s, the following conditions must be met:

(1) The Science Adviser must have attained high stature within the scientific and technical community before his appointment. He must be widely known and respected for the high quality of his professional achievements. Otherwise he will not command the instant credibility essential to success in this post.

(2) He or she must have a broad professional background (not limited to a narrow speciality), and must have had extensive, impressive experience in dealing with major policy issues (not merely technical matters): for the Science Adviser must operate at the interface between public policy and substantive scientific issues.

(3) While there must be a fundamental compatibility of points-of-view between the Adviser and the President he or she is to serve, there should be no litmus test imposed for initial support or opposition to particular programs or policies. Otherwise the President will discourage the very qualities of open-minded objectivity which the Adviser should exemplify.

(4) Since the impact of science and technology is ubiquitous, cutting across all international and domestic policy areas and impinging on virtually all departments and agencies, the scope of the Science Adviser's involvement should not be circumscribed. It is essential that he or she participate fully in both domestic and international policy deliberations. Accordingly, the Science Adviser should belong to both the Domestic Council and the National Security Council.

(5) Since the Federal R&D Budget approximates $70 billion annually, and since scientific and technical considerations are pertinent to many other components of the overall Federal Budget, it is also essential that the Science Adviser serve as a full partner in the shaping of the Federal Budget. Thus the Adviser should cooperate with the departments and agencies in developing options for utilizing science and technology to solve pressing problems and meet national goals. And the Adviser should work closely with OMB in evaluating relevant portions of proposed agency budgets.

(6) But equally important to scope of involvement is level of participation. In order to function with the degree of independence and initiative which is desirable, the Science Adviser should be accorded full cabinet rank, without portfolio. Thus the Adviser could interact with other top-level government officials as a peer, without the administrative encumbrances and limitations on objectivity inherent in the management of a cabinet department.

(7) Of course, in the final analysis, the Science Adviser's contribution to the success of the Administration will depend on the effectiveness of the relationship he or she develops with the President. It is essential that the Adviser report directly to the President, not through any intermediary. Naturally their relationship cannot be legislated or structured into being, since it will depend on personalities and predilections. But to foster the emergence of a good relationship, it is important that the Science Adviser not only hold cabinet-rank, but also be specifically designated as a full-fledged Assistant to the President. This designation will facilitate greater access to the President, which is a prerequisite to the development of an effective relationship.

(8) As capable an individual as the Adviser may be, his overall effectiveness will depend in part on the quality and size of his staff. While too large a staff would prove unwieldy for the essentially advisory functions of OSTP, the wide range of issues which the office must grapple with entails a staff of about thirty-five professionals, with necessary support personnel. In such an operation, of course, quality is even more important than quantity. Clearly the Adviser should seek only professionals of the highest competence. But even more importantly, the President should utilize his statutory authority

to appoint four Associate Directors of OSTP (at Level III of the Executive Schedule) in order to ensure high-level expertise across a variety of disciplines.

(9) But even with the assistance of four top-level Associate Directors and a professional staff of about thirty-five, the Science Adviser will not possess the full range of technical expertise necessary to cope with the entire gamut of problems confronting OSTP. He will unquestionably have to draw upon the vast technical expertise available throughout the various departments and agencies, as well as upon the independent information and judgment available from the National Academies of Science and Engineering and the National Institute of Medicine.

But none of these resources will be able to provide the highly effective, intimate interchange of information and ideas which characterized the President's Science Advisory Committee (PSAC) and the Science Adviser and President during the Eisenhower and Kennedy Administrations. There is a clear need for a top-level advisory body, embracing a range of disciplines, which can offer an objective, independent appraisal and perspective on the divers detailed studies and analyses.

In short, there is a need for a newly constituted President's Science/Technology Advisory Committee (PSTAC) to serve this important function. There are a number of obstacles to be overcome in successfully reconstituting such a committee. First, the much wider range of disciplines and issues to be dealt with in the 1990s makes consensus much more difficult to achieve than was the case when dealing primarily with military issues in the late 1950s and early 1960s. Second, the Freedom of Information Act and the Advisory Committee Act make it more difficult to achieve the informal intimacy of the old PSAC. Third, increased tension between the Executive and the Congress exacerbates the difficulty of any such activity. And fourth, the inherent dichotomy between the President's requirement for confidentiality and the scientific community's reliance on peer review in public creates a significant conundrum. But notwithstanding these difficulties, the need for a reconstituted PSTAC is compelling, and the challenge of creating this entity should be undertaken at the start of the new Administration.

(10) Even if all of the foregoing conditions are met, the Science Adviser to the next President cannot achieve maximum effectiveness unless he is appointed at the very start of the new Administration. Only if he assumes his post on January 20th -- having been designated during the transition -- can the Adviser play a key role in the selection of the key undersecretaries, assistant secretaries, and agency heads who will exercise significant science/technology related responsibilities. And only with such an early start can he significantly influence the initial shaping of Administration policies and positions. But in order for the appointment to be made during the transition, the prospective President must recognize the importance of the

position and must already have some ties to members of the scientific community in whom he has confidence.

In order to promote such awareness on the part of the presidential candidates, and to facilitate their interaction with leading members of the scientific community, the FAS wrote all candidates of both parties on January 27th, requesting their views on the role and appointment of the Presidential Science Adviser. As of the time of the submission of this statement to the Subcommittee, four of the candidates have replied; and the FAS letter and the four replies from Senators Gore and Simon and Representatives Gephardt and Kemp are attached to this statement for inclusion in the hearing record.

In view of the extreme importance and urgency of this issue, the FAS intends to followup vigorously on its initial letter by: (a) continuing to solicit the replies of the remaining candidates; (b) providing additional information on the issue to all the candidates; (c) publicizing their replies; (d) arranging appropriate forums for their interaction with leaders of the scientific community; (e) influencing both party platforms to incorporate planks calling for an early appointment and enhanced role for the Presidential Science Adviser; and (f) building widespread public awareness and support for this position.

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*Nobel laureates

The Honorable Albert Gore, Jr.   Jan. 27, 1988
Gore For President Campaign
1725 Jefferson Davis Highway, Suite 602
Arlington, Virginia 22202

Dear Al:

Many of the critical issues confronting the new President next January -- in arms control, space, defense, health, energy, environment, and international competitiveness -- will hinge on considerations of science and technology. The advice the President receives and relies on in resolving these complex issues will play a major part in determining the success of the new Administration.

Accordingly, the Federation of American Scientists, which was founded in 1945 by Manhattan Project scientists -- and which has retained an interest in science policy as well as the nuclear arms race -- invites you, as a presidential candidate, to express your position on assuring appropriate science/technology advice to the President. If received in time, your views, along with those of the other presidential candidates, will be distributed at a press conference on Presidential Science Advice in Boston on Saturday, February 13th, as part of an all-day symposium on the subject. The meeting will be conducted by the American Association for the Advancement of Science, with which FAS is cooperating. We should also like, with your permission, to publish these views in due course in our monthly FAS Public Interest Report, for which purpose we would need to receive your reply by April 15th.

In your response, we would welcome your comments on any issues you choose to consider concerning the process by which science/technology advice would be provided in your Presidency. However, the following questions have been suggested by various leaders of the scientific community as matters of general concern. We would welcome your addressing them, among other issues, in your reply:

National Council Members (Elected)
*Julius Axelrod
Bruce Blair
Deborah L. Bleviss
Rosemary A. Chalk
Thomas B. Cochran
E. William Colglazier
Hugh E. DeWitt
John Harte
*Dudley R. Herschbach
William A. Higinbotham
Art Hobson
Gerald Holton
Jerry F. Hough
Robert W. Kates
Henry C. Kelly
Barbara G. Levi
Francis E. Low
Christopher E. Paine
Victor Rabinowitch
Carl E. Sagan
Stephen H. Schneider
Andrew M. Sessler
George S. Stanford
Robert A. Weinberg
Ex Officio: John P. Holdren, Frank von Hippel

1. In selecting a Science/Technology Adviser, would you impose a litmus test on his or her support or opposition to particular positions or programs; and if so, which positions or programs?

2. To what extent would you require that your Science/Technology Adviser be someone of broad, top-level experience and stature within the scientific community?

3. Would you plan to appoint your Science/Technology Adviser promptly at the start of your Administration, with a view toward having the Adviser play a significant part in the selection of the subcabinet undersecretaries and assistant secretaries who have major science/technology related responsibilities?

4. To what extent do you consider it essential that the Science/Technology Adviser report directly to the President, rather than through some intermediary?

5. Do you intend to have the Science/Technology Adviser play a significant role in the development of the Federal Budget?

6. As you may know, Presidents Eisenhower, Kennedy, and Johnson utilized a President's Science Advisory Committee (PSAC), made up of distinguished leaders from a wide range of scientific disciplines, who periodically met to provide independent, objective advice to the President. This committee was discontinued during the Nixon Administration and has not been reconstituted since (although the current Administration does make use of a White House Science Council of advisers to the Director of the Office of Science and Technology Policy). In your Presidency, would you envisage reestablishing PSAC or a similar high-level body that could provide independent, objective advice directly to the President?

7. Do you currently draw on the scientific community for significant inputs to your positions on major issues? Feel free to indicate examples of issues on which their inputs have played a significant role; and, if you wish, to identify leading scientific advisers you have consulted and in whom you have confidence.

In preparing your replies and considering timing for the February 13th press conference, please feel free to contact Mr. Ellis Mottur, our Senior Adviser on Science/Technology Policy, who will be happy to discuss these issues in detail with you or your staff and to provide whatever assistance he can. Also do not hesitate to contact me directly if you wish.

Sincerely,

Jeremy J. Stone

AL
GORE
'88
☆☆☆
President

Question #1 In selecting a Science/Technology adviser, would you impose a litms test on his or her support or opposition to particular postitions or programs?

ANSWER: I am opposed to "litmus tests" per se. While I would select a Science Advisor whose views were generally compatible with my own, his or her value to thte President would be diminsihed if the selection process emiphaisezed abritrary qualifications.

Question #2 To what extent would you require that your Science Adviser be someone of braod, top level experience and stature within the scientific community?

ANSWER:. My Science Advisor would be recognized in the scientific community as having broad stature and experience, such as Jerome Wiesner who served under President Kennedy. Since science would be such a key element in my administration., I need the best advice available. This admistration has given us a chance to view the disasters that occur when the Science advisor has little stature or position. The result is that important decisions, such as replacing the lost space shuttle, simply are not made. I have often thought that the current adminstration has diminished the Science Adviser's to such a position that it probably would have abolished the post if there wasn't a statute that required it.

Question #3 Would you plan to appoint your Science Adviser promptly at the start of your Administration, with a view toward having the Adviser play a significant part in the selection fo the subcabinet undersecreatries and assistant secretaries who have major science related responsibilities?

ANSWER: My Science advisor would be appointed quite early, and would certainly play a large role in hepling to select key nominees for other scientific policy positions. I would point out, however, that the Science Advisor is subject to Senate confirmatin. While I have plenty of confidence that the Senate would act swiftly to approve any nominee I might send them, I would not be controlling the Senate schedule.

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PAID FOR BY ALBERT GORE JR FOR PRESIDENT COMMITTEE INC

Question #4 To what extent do you consider it essential that the Science Adviser report directly to the President, rather than through some intermediary?

ANSWER: It is essential that the Science Adviser have cabinet level status and report directly to the President. The whole point in creating this position was that the President receive solid, direct scientific advice. If it is filtered through less knowledgable officials, that advice is diluted.

Question #5 Do you intend to have the Science Adviser play a significant role in the development of the Federal Budget?

ANSWER: Yes, particularly so that the civilian R&D budget is not seriously eroded as it has been over the past seven years.

Question #6 In your Presidency, would you envisage reestablishing PSAC or a similar high-level body that could provide independent, objective advice directly to the President?

ANSWER: I think the reinstitution of a prestigious advisory body to the President is essential. However, I would not want to see a diminished role for the various more specialized Science Advisory Boards that many government agencies currently have.

Question #7 Do you currently draw on the scientific community for significant inputs to your positions on major issues?

ANSWER: In my eleven years in Congress, particularly when I chaired the House Oversight Subcommittee for Science and Technology, I examined a wide range of issues, including biomedical research, organ transplantation, environmental and occupational health issues, funding of R&D, and a wide examination of the future of information sciences, just to mention a few broad categories.

In each of these issue areas, I made it a point to consult with the finest scientific minds available. Sometimes the advice would come through formal mechanisms, such as hearings or via the Office of Technology Assessment advisory panels. Often we would simply maintain an informal dialogue with a network of prominent thinkers in a particular field. In all cases I sought to seek out the advice of the best scientific minds on any particular subject, and maintain these networks of advisors.
Thus in the field of technology transfer I relied on Dale Corson and Admiral Bobby Inman, just to name two from that field.

When I examined organ transplantation, I had the advice of Dr. Tom Starzl and Oscar Salvatierra. When I began to review the public policy implications of manipulation of the human genome, I consulted Dr. French Anderson and others. Without this kind of advice, I would have never enjoyed the successes I did in creating the Biomedical Ethics Board, or in passing the National Organ Transplant Act. Unless one's notions as legislator are organically connected with the relevant disciplines, they will rarely come to any fruition.

Response to Questionnaire
Submitted by
The Federation of American Scientists

Richard A. Gephardt
February, 1988

1. In selecting a Science/Technology Adviser, would you impose a litmus test on his or her support or opposition to particular positions or programs; and if so, which positions or programs?

No.

Unfortunately, the Reagan Administration has deemphasiced the exchange between the broad spectrum of the science community and the Office of the President. Instead of providing a framework by which private researchers can bring attention to innovative projects within their fields, this Administration has focused only on projects within the military, most significantly, research on the Strategic Defense Initiative.

The Gephardt Administration will maintain a non-partisan approach to scientific research. The total research and development effort by private industry in the United States as a percentage of the overall economy is lower than that of Japan, West Germany, and France. We need to put our research priorities in order. There is limited economic advantage to pouring federal money exclusively into military research. A strong and vital America must be on the forefront of today's technology and be able to transfer that technology into production. We must also be able to research and development projects for future opportunity and growth. Otherwise America will continue to fall short in the world trade market.

2. To what extent would you require that your Science/Technology Adviser be someone of broad, top-level experience and stature within the scientific community?

Especially in this time of budget constraints, we must make sure that federal dollars are well spent. In order to set our priorities in research and development, the Gephardt Administration will establish a Presidential Office of Research and Development to review the federal government's research budget. This office will be made up of experts in the various fields of scientific research.

3. Would you plan to appoint your Science/Technology Adviser promptly at the start of your Administration, with a view toward having the Adviser play a significant part in the selection of the subcabinet undersecretaries and assistant secretaries who have major science/technology related responsibilities?

In order to be competitive, we must immediately reorder our priorities for research and development. With this in mind, the Gephardt Administration will appoint a Science/Technology Adviser early on to play a significant role in developing policy and in selecting personnel.

4. To what extent do you consider it essential that the Science/Technology Adviser report directly to the President, rather than through some intermediary?

Each time I am faced with making a decision on a scientific or technical issue with which I am unfamiliar, I consult the experts in that particular field. Over the years, I have tapped the expertise of professors from universities within my district and scholars from some of America's finest research institutes. I a fortunate to have such a wealth of experts who are willing to brief me on these issues. I see no reason to change that as President.

5. Do you intend to have the Science/Technology Adviser play a significant role in the development of the Federal Budget?

In my Administration, we will have a Presidential Office of Research and Development. One of its responsibilities will be to review the research budget and reorder our priorities. We must set a national goal of investing in research and development equal to 3 percent of the Gross National Product (GNP) each year -- more if we can afford it.

Every program mandated by federal statute or receiving federal assistance should be evaluated on a regular basis to determine whether that program is utilizing the funds presently appropriated as intended by Congress. This sunset review should be carried out by an expert to establish whether the research dollars are efficiently spent and to evaluate whether an increase in funding is needed to allow the program to continue.

6. As you may know, Presidents Eisenhower, Kennedy, and Johnson utilized a President's Science Advisory Committee (PSAC), made up of distinguished leaders from a wide range of scientific disciplines, who periodically met to provide independent, objective advice to the President. This committee was discontinued during the Nixon Administration and has not been reconstituted since (although the current Administration does make use of a White House Science Council of advisers to the Director of the Office of Science and Technology Policy). In your Presidency, would you envisage reestablishing PSAC or a similar high-level body that could provide independent, objective advice directly to the President?

Yes. The Gephardt Administration will establish a Presidential Office of Research and Development to review the federal government's research budget and reorder our priorities, with which I will consult on a regular basis.

The Gephardt Administration will also form a commission to develop new programs in biological science, high technology, space technology, and other vital areas. In order to stay on top of development for the 21st century, the Gephardt Administration will take the lead in the new areas of science. Never again can we afford to concentrate solely on the military side of R & D. Instead, the Gephardt Administration will renew the commitment to life-saving sciences and the technology we need to compete in future.

7. Do you currently draw on the scientific community for significant inputs to you positions on major issues? Feel free to indicate examples of issues on which their inputs have played a significant role; and, if you wish, to identify leading scientific advisers you have consulted and in whom you have confidence.

As I mentioned earlier, I have made a practice of consulting with experts when making decisions on scientific and technical issues. Because of the wide array of issues with which I have been confronted in Congress, I have a wealth of experts from whom I have sought advice on a regular basis.

PAUL
SIMON
LEADERSHIP IN THE GREAT DEMOCRATIC TRADITION

January 29, 1988

Dr. Jeremy J. Stone
President
Federation of American Scientists
307 Massachusetts Avenue N.E.
Washington, D.C. 20002

Dear Dr. Stone:

Thank you for your letter of January 27 soliciting my position on assuring appropriate science/technology advice to the President. Let me preface my response by saying that I appreciate that almost all the issues which confront the President and the country today have scientific and technological components which require consultation with our best scientists and engineers. Basic to all your inquiries is the requirement of assuring that that information is made available to the President in a timely and complete manner, and that all major technical positions, both pro and con, are presented fairly and intelligibly together with their political implications. Since the Eisenhower administration - and with the exception of the Nixon administration - this process has focused upon the President's Science Advisor. So too does your letter, and I shall therefore respond in this context, although I am aware that there are those who believe a Cabinet-level Department of Science and Technology may be required to meet the new situation dictated by the technical needs of national economic competitiveness.

You enquire in particular as to whether I support a litmus test as to a possible Science Advisor's support or opposition to particular programs and positions. Whereas I certainly would not impose any technical prejudgement as a prerequisite for the selection of any Science Advisor, I would expect such a person to be compatible with the overall political positions of the President. For example, in my own case I believe a better balance is required between civilian and military research and development; in my view the Reagan administration has grossly favored the military (e.g. SDI) at the expense of civilian R&D. In FY88 the military will spend twice the federal government R&D funding alloted to all the civilian departments; the

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proportion would even be greater if engineering development funds were included.

You also ask to what extent would I require the President's Science/Technology Advisor be someone of broad, top-level experience and stature within the scientific community. One of the finest such advisors, Dr. James R. Killian the former MIT President, was himself not even a scientist. Dr. Jerome B. Wiesner, his successor both in the President's Office and at MIT, was once described by President Kennedy as the only real political-scientist in the White House. None of the President's Science Advisors has been awarded the Nobel Prize. Top-level technical credentials, per se, are not a prerequisite for the President's Advisor, in my opinion; although general technical understanding and competence certainly are. Rather I believe intellectual breadth and high-level, technically-related executive experience is demanded, together with appreciation and recognition of the political aspects of scientific and technical issues.

Next you ask whether I would promptly appoint the President's Science Advisor and whether I would look to him to advise on selections for other science/technology related appointments. The primary function of the transition period which precedes the inauguration of a new President is to identify and select candidates for the various appointed positions available to the new administration. As I believe it important to start a new administration with a complete team of appointees, it might be difficult, given the limited time available during the transition period, to essentially delegate responsibility for technical appointees to a potential Science Advisor, although were he selected early in the process I certainly would look to him to advise on the other technically-related appointments.

Then you ask to what extent would I consider it essential for the Science Advisor to report directly to the President. I believe the historical lesson is clear that direct reporting is indeed essential for the most effective functioning of the Science Advisor. In 1950 Mr. William Golden studied the problem and advised President Truman to appoint a Science Advisor and to establish a Scientific Advisory Committee both of which were to report directly to the President. However opponents of Golden's plan prevailed and the Committee was placed under the

Director of the Office of Defense Mobilization whose Director, General Lucius Clay, gave it little attention. This separation of the Advisor and the Committee was counterproductive. When Sputnik shook our technical complacency in 1957 President Eisenhower moved the Advisory Committee into the Executive Office of the President, and appointed Dr. Killian his Special Assistant for Science and Technology. Since that time the Science Advisor has reported directly to the President, except for the period of President Nixon, who disbanded the office, and the current incumbent who reports both directly to the President and through the White House Chief of Staff, an arrangement which has not proved particularly productive.

Later in your letter you ask a related question: whether I envision reestablishing a President's Science Advisory Committee, composed of distinguished scientists, which could provide independent, objective advice directly to the President, rather than as at present through the Director of the Office of Science and Technology Policy. The historical lesson is clear: an independent PSAC reporting directly to the President has proven to be most effective. While I would not wish to make a judgement at this time, on which I would prefer to consult first with my Science Advisor, I do lean to historical persuasion.

You also ask whether I would intend for the Science/Technology Advisor to play a significant role in the development of the Federal Budget. I would not wish to preempt the role of the Office of Management and Budget, but certainly a Science Advisor must play a major role in developing the Federal Budget, particularly as the role of science and technology is so pervasive in all our federal programs. While retaining the present relation between the OSTP and OMB, I personally would anticipate consulting directly with my Science Advisor on the science and technology components of the entire Federal Budget.

Finally, you inquire as to whether I currently draw upon the scientific community for input on major issues, and invite me to identify my leading scientific advisers. I have organized an advisory board of distinguished scientists and engineers, chaired by Mike McCormack, a former Congressman and an expert on energy and other technically-related policy matters. On my personal, as distinguished from my campaign, staff I have an IEEE Congressional Fellow, George Sponsler, who holds a Ph.D.

in engineering-physics and a J.D. in law. I count a number of excellent scientists, engineers, and other technically-trained individuals among my personal friends and advisers, including former Congressman Joe Fisher, an economist and lawyer, who also coordinates issues developed by all my advisory boards.

I trust these answers meet your needs. May I also add my best wishes for the continued success of the Federation of American Scientists and of its members who have done so much to advance the welfare of our country through science and technology.

Cordially,

Paul Simon

Paul Simon
U.S. Senator

PS/gs

JACK
KEMP
FOR PRESIDENT

February 4, 1988

Jeremy J. Stone
307 Massachusetts Ave. NE
Washington, DC 20002

Dear Jeremy:

Just a note of thanks for contacting my office with questions about my campaign. Your interest in my race for the Presidency is sincerely appreciated.

There are three overriding themes I shall focus on in my campaign for the Presidency: creating jobs and economic growth, protecting the security interests of the United States and the free world, and the defense of the family.

I'm pleased to share with you an outline of my views on key issues. This information highlights ideas that need to be advanced, and which I intend to address throughout my campaign for President of the United States.

The spirit of my campaign is really catching on across the country, and I'm working hard to earn your support. Thanks again for writing, and I look forward to hearing from you again soon. Hope you enjoy the enclosed.

Sincerely,

Jack Kemp

Jack Kemp for President
1815 N. Ft. Myer Dr., Suite 700, Arlington, VA 22209, Telephone (703) 247-1988
Paid for and authorized by Jack Kemp for President
Scott B. Mackenzie, Treasurer

JACK KEMP
FOR PRESIDENT

JACK KEMP ON THE STRATEGIC DEFENSE INITIATIVE

". . . As President, I would work to continue rebuilding America's national defense. I have long been a proponent of a strong defense and have consistently worked in Congress to ensure our national security. We must have a national defense---and a consistent foreign policy---that commands respect." I see the achievement of peace, with freedom, as one of the great challenges facing our country today.

Specifically, I believe the United States should move away from a defense based on the doctrine of mutual assured destruction to a far safer world of strategic defense. I am a strong supporter of President Reagan's Strategic Defense Initiative (SDI), and I have pledged to make the deployment of SDI a referendum issue of the 1988 campaign. There is no excuse for leaving the American people defenseless against a nuclear missile attack.

I stand firmly behind President Reagan's SDI research and testing program. However, I believe the time has come to move ahead toward early deployment of a space-based missile defense. . ."

Jack Kemp for President
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Scott B. Mackenzie, Treasurer

JACK
KEMP
FOR PRESIDENT

Jack Kemp on the Space Program

I favor a strong civilian space program, including the space shuttle and a space station. I think space exploration is crucial to improving our quality of life and strengthening our national defense. Money spent in research and development of space programs is well spent, in my opinion, and has many applications that will benefit our daily lives and better our understanding of the universe.

I am a strong supporter of the Strategic Defense Initiative. I want my generation to be able to tell our children and grandchildren that we have found a way to move away from a defense predicated on the doctrine of mutual assured destruction to a far safer world of strategic defense. I have pledged to make the deployment of SDI one of the referendum issues of my campaign.

If elected, I would set a time schedule for deploying a defense against Soviet nuclear ballistic missiles. The estimates of the Marshall Institute study with which the SDI Organization concurs is that the first phase of strategic defenses can be deployed by 1994. This would be a two layer defense consisting of space-based interceptors, a ground-based ERIS-like system, and associated tracking, surveillance, and command and control systems.

As President I will also continue research and development efforts on the follow-on phase of strategic defenses with a plan to deploy them as soon as they are available.

Jack Kemp for President
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Scott B. Mackenzie, Treasurer

JACK
KEMP
FOR PRESIDENT

JACK KEMP ON ARMS CONTROL AND THE USSR

". . . I strongly believe all negotiations with the Soviet Union must be conducted with principle, patience, and caution. In particular, America---primarily the Senate---and our allies must exercise extreme prudence and carefully examine the Intermediate-range Nuclear Force arms control agreement recently signed at the US-Soviet summit meeting in Washington.

The INF Agreement must be judged in terms that protect the fundamental security interests of the United States and our allies. The euphoria which followed the 1972 SALT agreements blinded us to the realities of Soviet military power, their proclivity to cheat on arms control agreements and their relentless policy of militant aggression and expansion in the Third World. We must not allow this to happen now, in the wake of the highly publicized visit of Soviet leader Mikhail Gorbachev.

The Soviet Union has broken every arms agreement it has ever made. Gorbachev's USSR has not permitted any of the standard elements of modern democracy, nor have they torn down the Berlin Wall or the Iron Curtain. The Soviet Union continues to flagrantly abuse the human rights of their own citizens and people abroad. Today, we continue to witness a growing threat of international communism, directed from the halls of the Kremlin.

As President, I would remain strong and speak the truth when dealing with the Soviets and their militant surrogates. We must hold them accountable for violations of the past---and call for real changes beyond mere words and shrewd public relations---before we rush toward an agreement for the future. . ."

Jack Kemp for President
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APPENDIX III

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ANALYSIS OF THE OFFICE OF SCIENCE AND TECHNOLOGY POLICY

Prepared at the Request of the
Subcommittee on Science, Research and Technology
House Committee on Science, Space, and Technology

Genevieve J. Knezo
Specialist in Science and Technology
Science Policy Research Division

February 10, 1988

CONTENTS

A. EXECUTIVE SUMMARY.. 1

B. ISSUES RELEVANT TO LEGISLATIVE OVERSIGHT OF OSTP..................... 4

C. INTRODUCTION.. 8

D. BRIEF HISTORY OF OFFICE OF SCIENCE AND TECHNOLOGY POLICY............. 9
   1. Enactment of Legislation to Create OSTP.......................... 9
   2. Key Differences Between OSTP and OST............................. 11
   3. Subsequent Changes to OSTP....................................... 15

E. OVERVIEW OF THE HISTORY OF LEGISLATIVE REVIEW OF OSTP SINCE 1976..... 15

F. ASSESSMENT OF OSTP'S STRATEGIC ANALYSIS AND PLANNING ACTIVITIES...... 17
   1. Long-range Planning Responsibilities Mandated by P.L. 94-282.... 18
   2. GAO Report on Non-compliance With the Statute................... 19

G. ILLUSTRATIONS OF OSTP'S ACTIVITIES................................... 22
   1. Accomplishments Under George Keyworth............................ 22
   2. Other Compilations and Illustrations of OSTP's Activities....... 25
   3. Concluding Observations.. 29

H. OSTP'S BUDGET-RELATED ACTIVITIES.................................... 30

I. MENTION OF OSTP IN OTHER STATUTES AND IN CONGRESSIONAL BILLS......... 33

J. ISSUES RELATED TO STATURE OF DIRECTOR AND STATUS OF THE OFFICE WITHIN THE EXECUTIVE OFFICE OF THE PRESIDENT............................... 37
   1. Elevate Status of the OSTP....................................... 40
   2. Proposal to Make OSTP Director a Cabinet Member Without Portfolio.. 42

K. STANDING OF THE OSTP DIRECTOR IN THE SCIENTIFIC COMMUNITY........... 44

L. PROPOSALS TO RESTORE A PRESIDENT'S SCIENCE ADVISORY COMMITTEE....... 47
   1. White House Science Council...................................... 47
   2. PSAC... 48
   3. Proposal to Create a Public New Science Advisory Apparatus...... 50

M. INTERAGENCY COORDINATION... 53
   1. Informal Coordination Mechanisms................................. 53
   2. Federal Coordinating Council on Science, Engineering, and Technology.. 54

N. OSTP'S COMPLIANCE WITH ANNUAL, FIVE-YEAR OUTLOOK, AND BIENNIAL REPORTS.......... 59
  1. Five-year Outlook.......... 60
  2. Enactment of P.L. 97-375.......... 61
  3. Annual and Biennial Reports.......... 62
  4. Research Briefings Reports.......... 64

O. BUDGET AND ORGANIZATIONAL ISSUES.......... 66

P. ADDITIONAL BIBLIOGRAPHY OF MATERIALS NOT ALREADY CITED.......... 66

A. EXECUTIVE SUMMARY[1]

The Office of Science and Technology Policy (OSTP) was created in 1976 pursuant to the National Science and Technology Policy, Organization, and Priorities Act, P.L. 94-282. The Director of OSTP, who is appointed by the President and confirmed by the Senate, is assigned the primary function of providing "within the Executive Office of the President, advice on the scientific, engineering, and technological aspects of issues that require attention at the highest levels of Government." (Sec. 204 (a) of P.L. 94-282). It appears that the only clearly mandated function assigned to the Office that has not been implemented is preparation of a one-time report, a "Federal Science, Engineering, and Technology Survey," basically a long-range strategic policy analysis of Federal missions, goals, personnel, funding, organization, facilities, and activities in science, engineering, and technology. The President's Committee on Science and Technology (PCST), originally created to complete the report was abolished without having prepared it. Responsibility for the report subsequently was transferred to OSTP. In response to a General Accounting Office (GAO) critique about not preparing the report, OSTP said that it was fulfilling this aspect of the law on a continuing basis because its work encompassed the issues specified to be included in the report and that OSTP's work is sufficiently anticipatory to meet the President's needs. However, critics say the operating style of OSTP may not necessarily reflect the independence of advice and analysis envisaged by the Act.

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[1] Findings of this report are limited to the extent that the Office of Science and Technology Policy has not yet responded to our request for information needed to assess adequately its activities. The report is consequently based on a number of congressional documents and the science policy literature. This is an extensively revised version of a paper entitled Preliminary Assessment of the Office of Science and Technology Policy prepared originally in January 1985 for the Subcommittee on Science, Technology, and Space, of the Senate Committee on Commerce, Science, and Transportation.

OSTP appears to have furnished all reports required by P.L. 94-282, as modified by P.L. 97-375, the Congressional Reports Elimination Act of 1982, which abolished the requirement for a separate five-year report. It called for the preparation of a "Science and Technology Report and Outlook," to be submitted to the Congress no later than January 15 of each odd-numbered year. However, this report has often been late and outdated. The last such report made public, which dealt with 1983-1984, was released on October 24, 1985. In addition to timeliness, the content of the report has been criticized as not being responsive to congressional mandate. P.L. 97-375 required the National Science Board's Science Indicators report to alternate with the OSTP report, and to be presented to Congress no later than January 15 of every even-numbered year.

Critics allege that OSTP's work is not sufficiently long-range and that OSTP does not effectively initiate and coordinate comprehensive science and technology policies. In response to such critiques, it can be noted that OSTP appears to take a more active role in some areas (such as military related issues) than in others. Some observers report that OSTP, under Director George Keyworth, made and implemented major initiatives that have modified national science and technology priorities, including increasing support for basic research, decreasing support for applied research, strengthening support for universities, and enlarging support for defense research and development from about 50 percent of the Federal R&D budget in 1980 to about 72 percent in 1988. In addition, recent OSTP Directors have stated that their major function is to serve the President and to communicate the President's views to the scientific and technological community, not to represent the scientific community to the President.

There is also criticism that the interagency coordination activities of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), which is chaired by the Director of OSTP is not effective. However, others say it is effective in some subject areas.

Questions remain about whether the independence and effectiveness of the office would be enhanced if: (1) the OSTP were elevated in the organizational hierarchy of the White House; (2) the office of the Director were made a higher level appointment, such as special assistant to the President (the status held by the presidential science advisors from 1957 to 1973) or Cabinet officer without portfolio so that communications with the President would depend less on personal relationships with White House counselors; (3) an organization like the President's Science Advisory Committee (PSAC) were restored (the PSAC was appointed by and advisory to the President; the current White House Science Council is appointed by the Director of OSTP and advisor to him); (4) the office were to play a more visible and effective role in budget-making for R&D; and (5) the office had a bigger budget and more resources.

There are also issues about whether (1) statutes mandating OSTP to perform science and technology policy functions in specific areas compromise its role of advising the President; and (2) if OSTP's interagency coordination activities warrant improvement.

B. ISSUES RELEVANT TO LEGISLATIVE OVERSIGHT OF OSTP

The following questions, representing issues for possible congressional oversight, are suggested by this preliminary analysis of the Office of Science and Technology Policy.

1. Dr. George Keyworth, the most visible of recent OSTP directors, often stated that his role is to serve and advise the President, not to represent the scientific community. Does such a posture enhance or weaken the performance of the Director as required in the act, or is such an attitude required in order to ensure that the information and advice provided by OSTP accommodates the President's policies?

2. Would the status and effectiveness of the OSTP be elevated if legislation were enacted to create a statutory science advisor, rather than continuing to permit the President to name the statutorily created Director of OSTP to be such an advisor at his discretion? What are the pros and cons of recreating the post of Special Assistant to the President for Science and Technology?

3. Is OSTP's work sufficiently long-range, strategic, and comprehensive to satisfy presidential needs and the congressional mandate to deal with national science policy needs? Should OSTP play a larger role in national science policy-making?

4. The OSTP under President Ronald Reagan established an advisory group, the White House Science Council, composed of expert private sector scientists and academicians. Exactly what has the group accomplished? Does it serve as

an effective substitute for the President's Committee on Science and Technology (PCST) or the President's Science Advisory Committee (PSAC)? Most of the members of the council are physical scientists by training. Does this bias the group's actions?

5. Should the President's Science Advisory Committee (PSAC) or a similar body be reestablished to provide the President with independent scientific and technological advice, which some deem essential for decision-making?

6. Could the White House Science Council (which is not mandated by statute and is only advisory to the Director of OSTP) serve this role?

7. What is the merit of the proposal made to establish a public national science policy advisory group, called the New Science Advisory Apparatus?

8. Since 1976, OSTP has been mandated by the Congress to perform specific science and technology policy and program functions. A complete list of such functions would be necessary to evaluate OSTP's compliance with the laws as well as to determine if it is appropriate to augment OSTP's responsibilities in such a manner or if mandating such work compromises the primary functions of OSTP by requiring that it spend time performing functions that were not mandated specifically by P.L. 94-282?

9. Which of the issues raised by the GAO in its 1980 oversight report of noncompliance with section 303 of P.L. 94-282, regarding preparation of a Federal Science, Engineering, and Technology Survey, remain appropriate for analysis? For instance, has the pattern of OSTP activities conformed to a reasonable level of "future-oriented" science and technology policy analysis as mandated by sec. 303 of P.L. 94-282, or should responsibilities for these functions be shifted to another body, as suggested by the GAO?

10. Does the current requirement for a biennial science and technology report and outlook motivate the formulation of coordinated, comprehensive science policies, or does it result merely in an exercise requiring Federal

agencies to summarize long-completed activities? Does the customary delay in presenting reports to Congress, usually well past the statutory deadline, vitiate their utility as budget review and policy documents for Congress?

11. What can be done to ensure that the OSTP complies with the requirements of P.L. 97-375, calling for a presidential statement on science and technology to be included in the biennial science and technology report and outlook?

12. Does the recital of science and technology activities during the preceding year that appears in the annual science and technology reports serve as an useful substitute for a "statement of the President's current policy for the maintenance of the Nation's leadership in science and technology," as required by sec. 202 of P.L. 94-282, as amended by P.L. 97-375?

13. What have been the major activities and accomplishments of the FCCSET, since 1980, when the last report of FCCSET activities was published?

14. Various interagency or multifaceted "prospective" policy analyses have been conducted for the OSTP by committees of the FCCSET, separate Federal agencies, expert groups, or panels convened by the White House Science Council. It would seem useful for these reports and their findings to be inventoried systematically. The pattern of reports, their findings, and usage as reported by the press, suggest several fundamental questions. Do these efforts and the resulting reports conform with the anticipatory policy making responsibilities given to the OSTP by statute and subsequent amendment? Does the OSTP Director act to implement the major policies recommended in these reports?

15. The OSTP has, for the last several years, received research briefings from the National Academy of Sciences (NAS) to help target priorities for Federal R and D support. Although the briefings reports are made available to Congress, a question remains about whether the Congress could be more formally involved in a NAS-instituted priority-setting process?

16. OSTP apparently prepares annual accomplishments reports for congressional appropriations hearings. Should this information be included in the annual science and technology outlook report?

17. Regarding OSTP's budget-analysis functions, is it possible for OSTP to increase its activities in support of priority setting for Federal R&D? Can OSTP promote a more effective and public priority-setting process for Federal R&D to help inform decision-makers in OMB and in Congress, who are increasingly being called upon to make priority choices among Federal science projects because of limitations on Federal spending?

18. Do the facts that most OSTP staff are detailees from other agencies (and that some are borrowed from external organizations) and that the OSTP budget has decreased in recent years compromise its ability to perform its functions? Is the office effectively staffed and managed? Would the office be more or less effective if it had a core civil service professional administrative staff?

19. Is OSTP more effective in some areas, such as defense, than others?

C. INTRODUCTION

This report was prepared as background for oversight hearings on the Office of Science and Technology Policy (OSTP). The report's findings are limited to the extent that the office has not yet responded to CRS's request for information needed to assess its activities adequately. The report is consequently based on a number of congressional documents and the science policy literature. It deals in order with the following subjects:

- brief history of the OSTP;
- overview of the history of legislative review of OSTP since 1976;
- assessment of OSTP's strategic analysis and planning activities;
- illustrations of OSTP's activities;
- OSTP's budget-related activities;
- mention of OSTP in other statutes and in congressional bills;
- the stature of the Director and the status of the office with the Executive Office of the President;
- standing of the OSTP Director in the scientific community;
- proposals to restore a President's Science Advisory Committee (PSAC);
- interagency coordination;
- five-year outlook; and
- budget and organizational issues.

D. BRIEF HISTORY OF OFFICE OF SCIENCE AND TECHNOLOGY POLICY

The key events in the history of the Office of Science and Technology Policy (OSTP) are as follows.

1. Enactment of Legislation to Create OSTP

OSTP was created by statute in 1976, as a successor (1) to the previous Office of Science and Technology (OST), which had been created in 1962 by executive order and effectively abolished in 1973, when President Nixon's Reorganization Plan No. 1 of 1973 became effective,[2] and (2) to the interim

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[2] David Z. Beckler, former executive officer of the President's Science Advisory Committee (PSAC), described the early history of the White House science and technology mechanism. It originated in 1951, during the Korean war when ". . . the question of how to mobilize science and technology in a national emergency situation resulted in the creation of a Science Advisory Committee to the Office of Defense Mobilization (ODM)."(p. 116-117.) On November 7, 1957, a few weeks after the launch of the Soviet Sputnik, President Eisenhower announced ". . . That he was creating the Office of Special Assistant to the President for Science and Technology and appointed James R. Killian, Jr. to fill it. Two weeks later, the President reconstituted the ODM Science Advisory Committee as the President's Science Advisory Committee in the White House." (p. 118) "The White House science and technology mechanism was given a statutory base by Reorganization Plan No. 2 of 1962, which established the Office of Science and Technology [OST] in the Executive Office of the President, and transferred to OST certain statutory responsibilities from the National Science Foundation." (p. 121.) (David Z. Beckler. The Precarious Life of Science in the White House. Daedalus. Science and Its Public: The Changing Relationship, Summer 1974.)

"Before 1962 the Special Assistant [for science and technology] was a confidential adviser to the President. What was expected of him was determined by the President and he reported only to the President. He was not expected to testify before the Congress and never did. After 1962 that was changed. Rather than being part of the White House staff, OST was an institution like the Office of Management and Budget. The Director's nomination was subject to confirmation by the Senate." (Hornig, Donald F. The President's Need for Science Advice: Past and Future. In Golden, William T., ed. Science Advice

Science and Technology Policy Office (STPO) in the National Science Foundation. Reportedly the President abolished the science office because: (1) its focus on basic science did not coincide with his emphasis on technology and on the use of science to solve domestic problems, (2) some of its reports and the public views of many members of the President's Science Advisory Body (PSAC) diverged from his on defense science issues regarding ABM and the funding of a civilian SST,[3] and (3) some critics said OST was becoming too influential in determining agency R&D budgets, to the chagrin of OMB. The 1973 reorganization plan vested the civilian science advisory functions of the Executive Office with the Director of the National Science Foundation (NSF). Concurrently the President accepted the resignations of PSAC and designated the

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to the President. New York, Pergamon Press, 1979, p. 45-46.)

The first high-level interagency committee for science and technology was the Interdepartmental Committee on Scientific Research and Development, created by executive Order 9912, December 24, 1947. In 1959, pursuant to Executive Order 19807 of Mar. 13, 1959, there was created a Federal Council in the Office of the Special Assistant to the President for Science and Technology. In 1962 it became part of the science advisory apparatus in the Executive Office of the President and maintained this function until 1973.

The OST and PSAC were abolished by Reorganization Plan No. 1 of 1973 which transferred the civilian functions of OST to the Director of the National Science Foundation. "In a separate Presidential letter, the NSF Director in his capacity as Science Advisor, was designated Chairman of the Federal Council for Science and Technology, which was transferred to the National Science Foundation and received staff support from the Science and Technology Policy Office." (p. 8.) The national security function of the OST was transferred to the National Security Council. At the same time the President accepted the resignations of the PSAC members. FCST was transferred to the National Science Foundation following the abolition of the OST in 1973, until the passage of the National Science and Technology Policy, Organization, and Priorities Act of 1976, P.L.94-282, when it was reestablished in the Office of Science and Technology Policy and renamed the Federal Coordinating Council for Science, Engineering and Technology. (Based on Beckler op. cit., p. 115-133, and U.S. Congress. House. Committee on Science and Technology. Subcommittee on Domestic and International Scientific Planning and Analysis. Interagency Coordination of Federal Scientific Research and Development: The Federal Council for Science and Technology. 94th Congress, 2nd Sess. By the Science Policy Research Division, Congressional Research Service, Library of Congress, July 1976, 447 p.)

[3] Beckler, David Z. The Precarious Life of Science in the White House. Daedalus, v. 103, summer 1974: 127. See also: Golden, William T., ed. Science Advice to the President. New York, Pergamon Press, 1980. 256 p.

NSF Director as chairman of the Federal Council for Science and Technology. From 1973 to 1976, the staff functions of the OSTP were carried out by the Science and Technology Policy Office (STPO) in the NSF.

2. KEY DIFFERENCES BETWEEN OSTP AND OST

The OSTP created in 1976 differed in a major respect from the former Office of Science and Technology in that its Director was not appointed at the level of Special Assistant to the President, but as Director of an office in the Executive Office of the President; the Director of the OSTP was not designated statutorily as science adviser to the President; and there were no requirements for creation of a permanent presidentially appointed science advisory committee. (The President's Committee on Science and Technology created by the act was to perform one function, a survey of Federal science and technology, and was to be abolished ninety days after finishing its work.) In addition, the Director of OSTP was not designated statutorily as Science and Technology Advisor to the President. The Director was authorized to advise the President on scientific and technological issues and R&D, to evaluate and make recommendations regarding Federal science and technology activities, to advise the President and work with the OMB in developing R&D and S and T budgets, (Sec. 204 of P.L. 94-282) to serve as Chairman of the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET), to serve as a member of the Domestic Council, and to advise the National Security Council (NSC) regarding science and technology issues, upon the request of the NSC. (Sec. 207).[4]

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[4] OSTP defines its major objectives as follows:

- o Advise the President on scientific and technological considerations involved in areas of national and international concern.

3. SUBSEQUENT CHANGES TO OSTP

Reorganization Plan No. 1 of 1977, as amended, and implemented by E.O. 12039, modified some of the provisions of P.L. 94-282. This occurred early in the Carter Administration in response to the President's goal of minimizing the size of his office. It made the following changes: the responsibility for preparing an Annual Science and Technology Report and a Five-Year Outlook (which were originally vested in OSTP) were transferred to the Director of the National Science Foundation; the President's Committee on Science and Technology (PCST) was abolished and its functions transferred to the President with certain of those functions transferred subsequently to the Director of OSTP. Those functions concerned with reorganization were transferred to the Director of OMB with advice and assistance to be provided by the Director of OSTP.[5] Basically, this meant, among other things, that responsibility for the

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- Assist the Office of Management and Budget with reviews of proposed budgets for Federal R&D programs.
- Advise the National Security Council on the scientific and technological factors related to national security and international issues.
- Advise the Office of Policy Development and other [Executive Office of the President] EOP units on matters concerning science and technology
- Provide general leadership and coordination of the research and development programs of the Federal government; analyze problems and developments in science and technology affecting more than one Federal agency and recommend policies and procedures for dealing with them.
- Encourage a stronger partnership between Federal research, State and local governments, and the scientific community
- Provide Executive Branch perspectives regarding science and technology policy to the Congress.

(U.S. Congress. House. Committee on Appropriations. Department of Housing and Urban Development--Independent Agencies Appropriations for 1988. Hearings before a Subcommittee. 100th Cong., 1st Sess. Part 4. Washington, U.S. Govt. Print. Off., 1987, p. 581.)

[5] Letter of Frank Press, Director of OSTP, to Elmer Staats, Comptroller General, July 3, 1980. In U.S. Comptroller General. The Office of Science and Technology Policy; Adaptation to a President's Operating Style May Conflict with Congressional Mandated Assignments. Washington, U.S. General Accounting Office, Sept. 3, 1980. p. 48-49.

preparation of the Federal Science, Technology and Engineering Survey, PCST's major responsibility, was transferred to OSTP. (The report was never prepared. See section F below.) Executive Order 12399 of December 31, 1982 abolished the Intergovernmental Science, Engineering, and Technology Advisory Panel that was authorized by P.L. 94-282 and created in OSTP pursuant to Executive Order 12039.

The Director of the National Science Foundation served as Director of OSTP from 1976 until January 20, 1977. President Carter's nominee, Dr. Frank Press, was confirmed as Director of OSTP on April 27, 1977. He was also named science advisor to the President. President Reagan's nominee for first director of OSTP, George Keyworth, was confirmed on July 24, 1981, and was sworn in on August 6, 1981. He was also named science and technology advisor to the President. Dr. Keyworth resigned effective in December 1985. He was succeeded by Dr. John P. McTague, who served as acting Director for almost one year. The current Director, who was confirmed by the Senate on Oct. 1, 1986, is Dr. William R. Graham, former NASA acting administrator. The current OSTP Director also serves as chairman of the Federal Coordinating Council for Science, Engineering and Technology and as advisor to the National Security Council on matters relating to science and technology.

On February 17, 1982, the OSTP announced the creation of a White House Science Council, composed of 15, primarily physical scientists, to assess major policy issues and advise OSTP.

The content, timing, and authorship of reports required from OSTP, pursuant to P.L. 94-282, as amended in 1977, was further modified in 1982, with the passage of P.L. 97-375, the Congressional Reports Elimination Act of 1982. It abolished requirements for preparing the Five-Year Outlook, specified as an OSTP function in P.L.94-282; changed the name of the annual report and restored responsibility to the Director of OSTP for preparing the report, now called, the biennial "Science and Technology Report and Outlook"; specified that the report should include a statement of presidential policy for science and technology; and specified that the report was required biennially, on January 15 of odd-numbered years, to alternate with the National Science Board's Science Indicators report, required to be sent to Congress on January 15 of even numbered years.

The details of OSTP's early history are amplified in a congressional committee print [6] and in CRS issue briefs.[7]

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[6] U.S. Congress. Senate. Committee on Commerce, Science, and Transportation and on Human Resources. A Legislative History of the National Science and Technology Policy, Organization, and Priorities Act of 1976. 95th Cong., 1st Sess. Washington, U.S. Govt. Print. Off., 1977, 824 p. (Committee print.)

[7] Establishment of a Presidential Science Advisory Organization: Legislative History and Summary of Events to 1977, Mar. 23, 1977. By Dorothy M. Bates. Congressional Research Service, IB77023.

Science and Technology in Policy Formulation at the Presidential Level: Recent Developments, Dec. 15, 1980. By William C. Boesman and Dorothy M. Bates, Congressional Research Service, IB78027.

E. OVERVIEW OF THE HISTORY OF LEGISLATIVE REVIEW OF OSTP SINCE 1976

OSTP's budget and activities are discussed annually at appropriations committee hearings. Several additional congressional inquiries have been made since 1976. These include:

an assessment of implementation of the National Science Policy Act, 1979;[8]

an analysis of the first annual science and technology report;[9]

nomination hearings;[10]

reviews of the five-year outlook;[11]

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[8] U.S. Congress. House. Committee on Science and Technology. National Science and Technology Policy Issues, 1979. Part II. Implementation of the National Science Policy Act. A Review Prepared by the Congressional Research Service. 96th Cong., 1st Sess. Washington, U.S. Govt. Print. Off., 1979, 135 p. Committee print.

[9] U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research, and Technology. Analysis and Commentary on the First Annual Science and Technology Report. Prepared by the Science Policy Research Division, Congressional Research Service, Library of Congress, 96th Cong., 1st Sess. Washington, U.S. Govt. Print. Off., 1980. 110 p. Committee print.

[10] U.S. Congress. Senate. Committee on Commerce, Science and Transportation. Nomination--Office of Science and Technology Policy. Hearing. 97th Cong., 1st Sess. July 20, 1981. Washington, U.S. Govt. Print. Off., 1981, 33 p.

U.S. Congress. Senate. Committee on Commerce, Science, and Transportation. Nominations--September--October. Hearings. Sept. 11, 1986. 99th Cong., 2nd Sess. Washington, U.S. Govt. Print. Off., 1987, (S. Hrg. 99-1042.)

[11] U.S. Congress. House. Committee on Science and Technology. Subcommittee on Science, Research, and Technology. Review of 1980 Five-Year Outlook Report on Science and Technology. Hearing. 96th Cong., 2nd Sess. June 1980. Washington, U.S. Govt. Print. Off., 1981. 97 p.

U.S. Congress. House. Committee on Science and Technology. Oversight Review of the Five-year Outlook Report on Science and Technology. Hearing, Jan. 29, 1984, 98th Cong., 2nd Sess. Washington, U.S. Govt. Print. Off.

oversight hearings;[12]

posture hearings;[13] and

appropriations hearings.[14]

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[12] U.S. Congress. Senate. Committee on Commerce, Science and Transportation. Subcommittee on Science, Technology and Space. Oversight on OSTP. Hearings, 96th Cong., 1st Sess., Mar. 7 and 21, 1970. Washington, U.S. Govt. Print. Off., 1979. 359 p.

[13] U.S. Congress. House. Committee on Science and Technology. 1983 Science and Technology Posture Hearing with Director, Office of Science and Technology Policy, Hearings, 98th Cong., 1st Sess., Washington, U.S. Govt. Print. Off., 1983. 59 p.

U.S. Congress. House. Committee on Science and Technology. 1986 Science and Technology Posture Hearings With the Director of the Office of Science and Technology Policy. Hearing, Washington, U.S. Govt. Print. Off., 1987. 53 p.

U.S. Congress. House. Committee on Science, Space, and Technology. Posture Hearings With the Science Advisor to the President. Hearing, 100th Cong., 1st Sess., Jan. 28, 1987. 126 p.

[14] See for example:

U.S. Congress. House. Committee on Appropriations. Department of Housing and Urban Development--Independent Agencies Appropriations for 1988. Hearings before a Subcommittee, Part 4. 100th Cong., 1st Sess., Washington, U.S. Govt. Print. Off., 1987. p. 555-626.

U.S. Congress. Senate. Committee on Appropriations. Subcommittee on HUD-Independent Agencies. Department of Housing and Urban Development, and Certain Independent Agencies Appropriations for Fiscal Year 1987. Hearings, Pt. 2. 99th Cong., 2nd Sess. on H.R. 5313. Washington, U.S. Govt. Print. Off., 1987.

U.S. Congress. House. Committee on Appropriations. Subcommittee on HUD--Independent Agencies. Department of Housing and Urban Development--Independent Agencies Appropriations for 1987. Hearings, 99th Cong., 2nd Sess., Washington, U.S. Govt. Print. Off., 1986. 650 p.

U.S. Congress. Senate. Committee on Appropriations. Subcommittee on HUD-Independent Agencies. Department of Housing and Urban Development, and Certain Independent Agencies Appropriations for Fiscal Year 1986. Hearings, 99th Cong., 1st Sess. on H.R. 3629. Washington, U.S. Govt. Print. Off., 1985. p. 99-221.

U.S. Congress. House. Committee on Appropriations. Subcommittee on HUD-Independent Agencies. Department of Housing and Urban Development--Independent Agencies Appropriations for 1986. Hearings, Pt. 2. 99th Cong., 1st Sess., Washington, U.S. Govt. Print. Off., 1985.

F. ASSESSMENT OF OSTP'S STRATEGIC ANALYSIS AND PLANNING ACTIVITIES

Some say that OSTP should, but does not now, play the role of a centralized arbiter of Federal science and technology policy, specifically in regard to deciding R&D budget priorities and orchestrating comprehensive science and technology policies which cut across Federal agency responsibilities. An example of a legislative initiative in this direction is the introduction, in the 98th Congress, by Senator Slade Gorton of S. 614, the National Science and Technology Improvement Act of 1983, which reinforced and defined specific responsibilities for the OSTP to develop policies for R&D, science policy, and technical manpower. It also directed the OSTP to assess influences that affect children's interest in science and mathematics. It was not enacted.

According to some of its critics, OSTP does not readily influence the formulation of science policies because it is unable to do adequate long-range planning and strategic analysis. Accordingly, they say, OSTP's strength is in its ability to respond to crisis situations and short-range presidential science and technology policy needs, which may embody a long-range perspective only incidentally. For instance, Wil Lepkowski, writing in Chemical and Engineering News concluded that: "The test of whether OSTP as an institution is working well is not only its ability to help the Administration put out political fires. Its main goal is to provide the White House [with] balanced advice on science and technology at a time when they are clearly affecting everything else."[15]

1. LONG-RANGE PLANNING RESPONSIBILITIES MANDATED BY P.L. 94-282

P.L. 94-282, which created OSTP, contained provisions that gave it and its associated bodies certain comprehensive policy planning functions, which have never been filled. However, OSTP maintains that its other activities have served to fill the spirit and intent of these sections of the law. This issue is described next.

The only provision of the statute, as amended (by executive order and statutory enactments), which has not been implemented, is section 303 of Title III of P.L. 94-282. Title III authorized the creation of a President's Committee on Science and Technology (PCST), and outlined its membership, balance, functions, support services, and duration. The committee was created in 1976, but it was disbanded in 1977. It was formally abolished and its functions were transferred to the President and then delegated to the OSTP in 1977 with the enactment of Reorganization Plan no. 1 of 1977, as amended, and implemented by E. O. 12039. The committee had not prepared the Federal Science, Engineering, and Technology Survey, specified in section 303.

Specifically P.L. 94-282 had required the committee to:

> survey, examine, and analyze the overall context of the Federal science, engineering, and technology effort including missions, goals, personnel, funding, organization, facilities, and activities in general, taking adequate account of the interests of individuals and groups that may be affected by Federal scientific, engineering, and technical programs,including, as appropriate, consultation with such individuals and groups. (Sec. 303 (a) of P. L. 94-282.)

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[15] Lepkowski, Wil. Chemical and Engineering News, Sept. 22, 1986. p. 17.

The statute targeted 13 specific program and policy areas for analysis in the survey, including:

organizational reform to consider creation of a Department of Science and Technology;

scientific and technical information;

technology assessment mechanisms;

technology transfer and innovation methods;

public/private collaboration;

streamlining Federal regulations;

the support base for scientific research;

research and educational capabilities of academic institutions;

science and technology in national and international policy making;

technology for community and individual needs;

scientific and technical manpower;

improved planning and analyses of Federal R&D programs; and

long-range study, analysis, and planning for applying science and technology to major problem areas.

2. GAO Report on Non-compliance With the Statute

In a report released in 1980, entitled Office of Science and Technology Policy: Adaptation to a President's Operating Style May Conflict With Congressionally Mandated Assignments, the General Accounting Office (GAO) criticized OSTP for not preparing the survey report, suggested that it do so, and that the OSTP Director establish "a formal means for identifying emerging issues and suggesting priorities."[16] The GAO report identified an enduring dilemma in the functions Congress mandated for OSTP: the conflict between short-range analyses and assessments of mission-related research and development activities so essential for presidential decision making and the longer range science and technology analysis mandated by the statute, but perhaps less relevant for presidential needs. In fact, GAO suggested that Congress might want to examine whether some other group should be given the longer range tasks assigned to OSTP.

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[16] The Office of Science and Technology Policy: Adaptation to A President's Operating Style May Conflict With Congressionally Mandated Assignments. U.S. General Accounting Office, Washington, D.C., Sept. 3, 1980. 54 p.

The intent of the long-range analysis functions of the OSTP were mandated in the Declaration of Policy of P.L. 94-282. This states in part:

> [T]he Congress declares that:
>
> (1) The Federal Government should maintain central policy planning elements in the executive branch which assist Federal agencies in (A) identifying public problems and objectives, (B) mobilizing scientific and technological resources for essential national programs, (C) securing appropriate funding for programs so identified, (D) anticipating future concerns to which science and technology can contribute and devising strategies for the conduct of science and technology for such purposes, (E) reviewing systematically Federal science policy and programs and recommending legislative amendment thereof when needed. Such elements should include an advisory mechanism within the Executive Office of the President so that the Chief Executive may have available independent, expert judgment and assistance on policy matters which require accurate assessments of the complex scientific and technological features involved.
>
> (Sec. 102 (b) (1) of P.L. 94-282.)

OSTP replied to the GAO criticism by listing the work it had done already in the 13 areas identified for the PCST survey and said that the distinction between, on the one hand, short-range strategic planning on topical or mission issues and, on the other, comprehensive strategic planning, should not be overdrawn, and by implication that OSTP's shorter range work serves more comprehensive planning purposes. It added that OSTP has proven to be an essential policy component of the White House, and has already "worked to implement programs and policies which address many of the underlying issues

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(PAD-80-79.)

that were raised by the Congress in the discussion surrounding the passage of P.L. 94-282 and Title III in particular."[17]

According to the GAO, an OSTP official told a congressional appropriations hearing in 1979 that OSTP would not issue the survey report mandated by the statute.[18] There are no indications that the OSTP plans to issue the report called for in section 303.

One of the co-authors of the GAO report, who continued to follow OSTP closely, reported in 1985 that GAO may have been unrealistic to expect OSTP to engage in comprehensive longer-range strategic planning and analysis, which might not suit presidential decision making needs. OSTP, he said, was now doing significantly better than before, and probably as well as can be expected.[19]

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[17] Letter: Frank Press to Elmer Staats, July 3, 1980. In U.S. Comptroller General. The Office of Science and Technology Policy: Adaptation to a President's Operating Style May Conflict With Congressionally Mandated Assignments. Washington, U.S. General Accounting Office, Sept. 3, 1980. p. 48. See also Walton, Susan. OSTP Caught in Tug of War Between Congress and White House. BioScience, Nov. 1980, v. 30. p. 785-787.

[18] The Office of Science and Technology Policy: Adaptation to President's Operating Style May Conflict with Congressionally Mandated Assignments, op. cit., p. 50.

[19] Interview, Howard Gobstein, General Accounting Office, Feb. 4, 1985.

C. ILLUSTRATIONS OF OSTP'S ACTIVITIES

It is apparent that the OSTP has done considerable and sometimes, comprehensive work in the 13 national science policy areas listed in Title III of P.L. 94-282. OSTP's activities, undoubtedly, have been useful to decision making at least to the extent that they informed the scientific community about the views of the science advisor and the President on national science policy issues. However, it cannot be concluded definitively whether or not OSTP's work has had an effect on presidential or budgetary decisions or whether it is of a comprehensive strategic nature.

Two approaches are used here to attempt to measure OSTP's influence. One is to look at the accomplishments of George Keyworth, President Reagan's first science advisor, and the second is to identify the scope of OSTP's activities.

1. Accomplishments Under George Keyworth

The content and thrust of Federal programs and policies for science and technology has changed significantly during the Reagan Administration.[20] If one were to use the initiation of such policies as a measure of whether the OSTP has affected long-range policy making, it seems clear that OSTP has conducted work in, if not influenced, policies which will change the future directions of Federal science and technology policy. In fact, although Dr. Keyworth was widely criticized by the scientific community when he was appointed, upon his resignation, William Carey, executive officer of the American Association for the Advancement of Science, said [George Keyworth] " 'is going to be missed.' Keyworth has developed over his five years in the job into an effective and sometimes aggressive advocate of fundamental research."[21]

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[20] Keyworth, George A., II. Science and Technology Policy: The Next Four Years. Technology Review, v. 88, Feb-Mar. 1985. p. 45-46, 48 50-53.

As just mentioned, one of the major changes initiated during the Reagan Administration was the emphasis on basic research:

> During the Keyworth era, funding for basic research surged by 56% to a new high of $8 billion in fiscal 1986, with more than half the support going to universities. The total increase is equal to a real rise of 26% after inflation is taken into account. This was exceeded only during the peak years for scientific research just after Sputnik.[22]

In addition, the staff of the OSTP and the OMB have been credited with helping to write the President's Message on Competitiveness, "Quest for Excellence," released in conjunction with the President's January 27, 1987 State of the Union speech. This contained President Reagan's first major outline of national science and technology policy.[23]

The following list contains additional programs and policies which have been cited by various sources as exemplifying the major changes and/or accomplishments of OSTP during the Reagan Administration so far:

-helping to produce a climate of research cooperation between universities and industry;

-upgrading engineering research and education in the National Science Foundation;

-improving the quality of agricultural research;

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[21] Hilts, Philip J. Science Adviser Keyworth To Leave White House Job. Washington Post, Nov. 30, 1985. p. A11.

[22] Keyworth: Parting Shots From the White House Science Office. Physics Today, v. 39, Feb. 1986. p. 57.

[23] Lepkowski, Wil. Reagan Offers His Vision of Science and Technology in National Policy. Chemical and Engineering News, v. 65, Feb. 16, 1987. p. 17-18.

-reorienting the Department of Energy's national laboratories toward more cooperation with industry and universities;

-producing a report describing steps to eliminate acid rain pollution;[24]

-". . . designing a science and technology policy more geared to the capitalist market system than [had been done before by] any science adviser in the 40-year history of the ilk;"[25]

-keeping ". . . science funding high while other budgets were being cut;"[26] and

-increasing support for defense R&D.

Two specific kinds of functional criticisms were directed at the Keyworth tenure. One related to a perception of the Director's failure to shape some agency priorities. Early in the first Reagan Administration, Dr. Keyworth tried to focus the National Institute of Health (NIH) on helping to develop the biotechnology industry. In an interview published in Science and Government Report he commented that the progress made so far "in prodding NIH toward . . . [the] goal of being more concerned about the biotechnology industry" was "marginal."[27] However, in response to this criticism it should be noted that historically NIH has stressed its research role and undoubtedly has challenged proposals to move it toward fostering commercial applications.

There was also some criticism that OSTP is too physics oriented and defense oriented:

> Keyworth's stewardship at OSTP has been criticized on the grounds that the administration placed too much emphasis on physics and defense research at the expense of biology, agriculture, and the social sciences. Applied research--shorter-term projects that hold the promise of commercial payoff--was considered the province of private industry and often sheared from Federal programs. . . . Many

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[24] Lepkowski, Wil Peers Rate Keyworth Generally High as President's Science Adviser. Chemical and Engineering News, Nov. 26, 1984. p. 8.

[25] Ibid., p. 10.

[26] Hilts, op. cit., p. A-11.

[27] Keyworth: After the Ouster Rumors, a Second Term. Science and Government Report, Jan. 15, 1985, p. 4.

projects in the Federal national laboratory system, particularly in energy research and the biomedical sciences, were decimated.[28]

2. OTHER COMPILATIONS AND ILLUSTRATIONS OF OSTP'S ACTIVITIES

It is not possible to give a comprehensive listing or review of OSTP's work because the OSTP has not yet responded to CRS requests for compilations of its reports and other activities. OSTP's last comprehensive bibliography apparently was published in 1979.[29] The OSTP itself and its associated body, the White House Science Council, have from time to time released commissioned or prepared reports.[30] But OSTP has not provided a comprehensive listing of

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[28] Osterlund, Peter. Ronald Reagan's Top 'Star Wars' Salesman Departs: 'President Has Made Me Obsolete.' Christian Science Monitor Dec. 24, 1985. p. 1, 28.

[29] Office of Science and Technology Policy. In U.S. Executive Office of the President. A Guide to the Publications of the Executive Office of the President, v. 1, June 1979.

[30] The following citations are included in the Library of Congress card catalogue, or are known from another source:

U.S. Office of Science and technology Policy. Activities of the Federal Council for Science and Technology and the Federal Coordinating Council for Science, Engineering and Technology; Report for 1975 and 1976. Washington, 1977. 71 p.

U.S. Dept. of Energy. Office of Science and Technology Policy. Working Group on Basic Research. Report, Washington, D.C., 1978. 35 p.

U.S. Office of Science and Technology Policy. Earthquake Hazards Reduction: Issues for An Implementation Plan. Washington, 1978. 231 p.

U.S. Office of Science and Technology Policy. Natural Resources and Environment Task Force. State and Local Government Perspectives on a Landsat Information System. Washington, 1978. 1 v. various pagings.

National Research Council (U.S.). Committee on the Education and Employment of Women in Science and Engineering. Climbing the Academic Ladder: Doctoral Women Scientists in Academe: A Report to the Office of Science and Technology Policy from the Committee on the Education and Employment of Women in Science and Engineering, Commission on Human Resources, National Research Council. Washington, D.C., National Academy of Sciences, 1979. 155 p.

National Research Council (U.S.) Committee on the Education and Employment of Women in Science and Engineering. Women Scientists in Industry and Government; How Much Progress in the 1970s?: An Interim Report to the Office of Science nd Technology Policy from the Committee on the Education and Employment of Women in Science and Engineering, Commission on Human Resources, National Research Council. Washington, D.C., National Academy of Sciences, such reports. Nevertheless, public information about OSTP's activities has appeared in a variety of materials. For instance, in two articles that reviewed the period 1976 to 1980, OSTP Director Dr. Frank Press described work in the following areas: industrial innovation, science and engineering education, encouragement of programs of government-industry-university cooperation, reduction of unnecessary regulations,[31] science and technology cooperation with

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1980. 56 p.

Consolidation of Federal Scientific and Technological Activities/ Executive Office of the President, Office of Science and Technology Policy. Washington, D.C., The Office, 1980;, various pagings.

Clough, Ralph N. A Review of the U.S.-China Exchange Program. Ralph N. Clough. Washington, D.C., Office of Research, International Communication Agency, 1981. 116 p. "Prepared under contract with the White House Office of Science and Technology Policy (OSTP) and the Office of Research, U.S. International Communication Agency."

United States. Office of Science and Technology Policy. Aeronautical Research and Technology Policy. Washington, D.C., Executive Office of the President, Office of Science a;nd Technology Policy, 1982.

Report of the White House Science Council. Federal Laboratory Review Panel. Washington, Office of Science and Technology Policy, May 1983, 13 p. plus appendices.

General Comments on Acid Rain. Summary by the Acid Rain Peer Review Panel for the Office of Science and Technology Policy. Washington, Office of Science and Technology Policy, 1983. 5 p.

Acid Rain Peer Review Panel (U. S.) Report Prepared for the U.S. Office of Science and Technology Policy. Washington, The Office, available from NTIS, 1984, ca 113 p. in various pagings.

Progress Report on Implementing the Recommendations of the White House Science Council's Federal Laboratory Review Panel. Vol. II. Status Reports by Agencies. Washington, Office of Science and Technology Policy, May 1984. 61 p.

Report of the White House Science Council. Panel on the Health of U.S. Colleges and Universities. Washington, Office of Science and Technology Policy, Feb. 1986. 53 p.

Biotechnology risk Assessment: Issues and Methods for Environmental Introductions. Edited by Joseph Fiksel, Vincent T. Covello. New York, Pergamon Press, 1986. 174 p. "Final Report to the Office of Science nd Technology Policy, Executive Office of the President.

U.S. Office of Science and Technology Policy. Biennial Science and Technology Report to the Congress: 1983-1984. Washington, National Science Foundation, for sale by the Supt. of Docs., G.P.O., 1986. 141 p.

[31] Press, Frank. Science and Technology in the White House, 1977 to 1980: Part I. Science, v. 211, Jan. 9, 1981. p. 139-145.

China, review of the Nation's civilian space programs and policies, and development of a national aquaculture plan.[32]

Some of OSTP's work is also chronicled in its activities reports, which often are printed in congressional appropriations hearings. According to OSTP's fiscal year 1986 activities report, which appeared in the fiscal year 1988 House appropriations hearings, the OSTP also did work in such areas as: implementing aeronautical R&D policy; developing a plant science initiative; Arctic research; developing domestic policy on Agent Orange; biotechnology research and risk policies; science and technology in relation to competitiveness; conventional force enhancement; defense basic research; arms control; economic aspects of health care policy; energy preparedness planning; restoration of nuclear energy; Federal laboratories; fusion energy device; health of universities; implementation of carcinogen policy; implementation of policy for research involving animals; indirect costs policy; international science initiatives; materials policy; minority issues in science and technology; policy to protect human subjects; space policy; nuclear winter; radiation research and policy; risk assessment; the Superconducting Super Collider; strategic defense initiatives; supercomputer policy; technology for counter terrorism; international technology transfer policy; telecommunications policy; global competitiveness; small business innovation research; competitiveness of U.S. industry; interdisciplinary research centers; semiconductor industry initiatives; and science, mathematics, and engineering education. [33]

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[32] Press, Frank. Science and Technology in the White House, 1977 to 1980: Part 2. Science, v. 211, Jan. 16, 1981. p. 249-256.

[33] A Summary of Accomplishments in FY 1986 by the Office of Science and Technology Policy. In U.S. Department of Housing and Urban Development--Independent Agencies Appropriations for 1988. Hearings before a Subcommittee, Part 4. Washington, U.S. Govt. Print. Off., 1987, p. 597-626. A 1983 activities report was included as: A Summary of Accomplishments in FY 1983 by

In addition, the Director of OSTP has testified about the agency's work at congressional hearings. As an example, the following information was given about OSTP activities relating to enlarging the participation of blacks and women in science and technology:

> OSTP has been working with the White House Initiative on Historically Black Colleges and Universities (HBCUs) in the Department of Education to address the under representation of blacks in certain disciplines of science and technology (e.g. , physics, math, chemistry, engineering). In September of 1986 we co-sponsored a national conference entitled HBCU Alliances with Frontier Sciences at the National Academy of Sciences to examine the effectiveness of cooperative programs between traditionally black institutions, Federal laboratories, and corporate research programs. Several recommendations from that conference are under consideration for implementation.
>
> OSTP has also initiated the Task Force on Women, Minorities and Handicapped in Science and technology as required by P.L. 99-383. This task force will be examining the use and coordination of Federal agency programs to improve the participation of all three groups in S&T. The Task Force will consider the short-term problems of retention and the long-range problems of entrance into the pipeline. It will not merely conduct one more study, but will rather be an action oriented group which will recommend, review and evaluate changes in each of the Federal agency programs.[34]

As another example, during 1986, OSTP initiatives relating to indirect cost policies for universities (allowable overhead cost rates) focused on:

> OSTP has had a leadership role in developing indirect cost policy for this Administration. I expect it to continue to coordinate this effort in all of the Federal agencies.
>
> . . . The recommendations on the indirect cost issue in the White House Science Council (WHSC) report on the health of U.S. colleges and universities are the result of a long process of discussion and deliberation. The University Panel was composed of very distinguished university administrators and faculty and representatives from industry. The Panel and the OSTP staff received input from over 100 members of the university and industrial

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the Office of Science and Technology Policy. In U.S. Congress. House. Committee on Appropriations. Department of Housing and Urban Development--Independent Agencies Appropriations for 1985, Part 4. 98th Cong., 2nd Sess., Washington, U.S. Govt. Print. Off., 1984. p. 173-81.

[34] U.S. Congress. House. Committee on Science, Space, and Technology. Posture Hearing with the Science Advisor to the President. 100th Cong., 1st Sess., Jan. 28, 1987. Washington, U.S. Govt. Print. Off., 1987. p. 75.

research community. The recommendations represent the best thinking of the WHSC and its panel.[35]

3. CONCLUDING OBSERVATIONS

While it is not easy to evaluate the impact or long-range orientation of OSTP's work, there is considerable evidence that the agency has worked in contemporary national science and technology policy issues and that the Reagan Administration has made major changes in policy which coincide with many of the positions set forth by the agency. OSTP has not produced some of the formal comprehensive reports required in its enabling legislation and some others are late and out-dated. And the agency has not satisfied critics who say its work is too short-range and crisis oriented. However, there is a persuasive view that OSTP's major job is to serve the President and to communicate his views to the scientific and technological community, and that it performs this function adequately.

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[35] Nominations--September--October, op. cit., p. 33.

H. OSTP'S BUDGET-RELATED ACTIVITIES

The OSTP Director's budgetary functions were specified in P.L. 94-282 as follows:

> [T]he Director shall . . . advise the President on scientific and technological considerations with regard to Federal budgets, assist the Office of Management and Budget with an annual review and analysis of funding proposed for research and development in budgets of all Federal agencies, and aid the Office of Management and Budget and the agencies throughout the budget development process. (Sec.204(b) b3).)

Federal R&D funding is part of the discretionary budget and is increasing while some other discretionary budget items are being trimmed. Thus R&D is becoming an increasingly more visible and fungible commodity, subject to bargaining and politicking. At the same time more and more large science projects are being proposed such as in energy and space which compete for funds with traditional individual-investigator initiated R&D in such fields as health, materials and other areas of small science.

One major criticism of OSTP is that it has not effectively persuaded scientists and Federal administrators to develop an informed process of priority-setting for R&D funding. Without knowledge of day-to-day activities, it is difficult to describe how active OSTP and the President's science adviser are in helping to formulate science budgets. However, the science advisor has testified that the agency ". . is involved on a constant basis in the national level budget review and budget prioritization that is done in conjunction with and under the general direction of the Office of Management and budget for the President."[36] This process was described in some detail in the FY86 OSTP activities report:

> Agency Long-range Planning Reviews
>
> During this period of rapid advances in virtually all fields of scientific and engineering research, it is essential that OSTP stay abreast of Federal plans to meet national S&T objectives, including recommendations of presidentially commissioned and White House Science Council reports. Accordingly, the Science Advisor has invited all major agencies supporting R&D to review their long-range plans, major research goals, scientific thrusts, and key issues with OSTP staff. Through this series of briefings, OSTP has been able to help agencies prepare for the important strategic choices that lie ahead of the FY 1988 budget submission to OMB.[37]

Several factors undoubtedly militate against OSTP taking a more active role in priority setting and budget making. As noted above, P.L. 945-282 has already vested authority in OSTP to perform budget-related functions. Thus it could be concluded that, if OSTP wanted to take a more active role in this sphere, it would. Related to this, there are allegations that OST's (OSTP's predecessor) active attempts to influence R&D budget-making incurred OMB objections that OST and scientists were adopting the posture of a special pleader like any other lobbying group. This allegedly was one of the factors which led to the 1973 presidential decision to abolish OST.

In conclusion: while OSTP has precise responsibilities to help develop Federal science budgets, there is little public information available about how it fulfills this role. Some critics say it has not contributed effectively to the budget-making process; but some observers note that the OST-OMB budget-making relationship was difficult. Thus questions remain. Just what role does the OSTP play in budget-making? Should OSTP institute or promote a more public priority-setting process for Federal R&D, to help inform decision-makers in OMB and in Congress, who are increasingly being called upon to make priority choices among Federal science projects, because of limitations on Federal spending?

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[36] U.S. Congress. Senate. Committee on Commerce, Science, and Transportation. Nominations--Sept-Oct. 99th Cong., 2nd Sess. Washington, U.S. Govt. Print. Off., 1987. p. 14. (S. Hrg. 99-1042.)

[37] A Summary of Accomplishments in FY 1986 by the Office of Science and Technology Policy. In House. Committee on Appropriations, Department of Housing and Urban Development--Independent Agencies Appropriations for 1988, op. cit., p. 598.

I. MENTION OF OSTP IN OTHER STATUTES AND IN CONGRESSIONAL BILL

OSTP has been mandated by statute to undertake specific tasks in science and technology policy. In recent years, several bills have been introduced during each Congress to require the OSTP to fulfill some obligation relating to Federal science and technology policy--generally to create a program or policy. These bills are generally introduced either to give the activity the stature, visibility, or authority presumably accorded by association with the presidential science and technology policy unit, or to mandate the OSTP to engage in an activity now absent from its agenda.

It may be appropriate for the committee to obtain a list of all statutes which require OSTP to perform a specific science and technology programmatic or policy function to determine if OSTP is complying with these statutes as well as to determine if the mandating of additional specific functions to OSTP would compromise its major responsibilities and functions. This report does not provide a complete list of such responsibilities because OSTP has not yet responded to CRS's request for a list of such statutes. One of the earliest statutes of this nature was the Food and Agriculture Act of 1977, P.L. 95-113, which required the FCCSET to establish a Subcommittee on Food and Renewable Resources. More recently, P.L. 98-373, the Arctic Research Policy Act, required the OSTP to review all agency budgets and programs related to the Arctic and to prepare long-range reports on the Arctic program. Other acts give OSTP responsibilities dealing with such issues as science and engineering education, science and foreign policy, biotechnology, earthquake hazards reduction, environmental R&D, and so forth.

The following are examples of legislation introduced during the 100th Congress requiring some action by the OSTP:[38]

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[38] Among such initiatives introduced in the 98th Congress are:

98th Congress

P.L. 98-373, July 31, 1984. Provides a comprehensive national policy dealing with national needs and objectives in the Arctic (S.373) and established a National Critical Materials Council to assist OSTP in preparing long-range materials assessments and reports (S.373, which incorporated a revised version of H.R. 4186).

S. 2204, introduced Jan. 23, 1984 by Sen. Helfin. It would have established a National Computer Institute within the Office of Science and Technology Policy to insure U.S. preeminence in computer development, education, and national security.

H.R. 30, introduced by Rep. Perkins, to provide assistance to improve elementary, secondary,and postsecondary education in mathematics and sciences Would have required the director of OSTP to participate in selecting scholars to be awards scholarships.

H.R. 480, sponsored by Rep. George Brown, to maintain and enhance the U.S. leadership in information science and technology by establishing an Institute for Information Policy and Research to address national information policy issues and a forum and mechanism to discuss, plan and coordinate national efforts and Federal research activities.

H.R. 582, National Engineering and Science Personnel Act of 1983, sponsored by Rep. Don Fuqua. To place responsibility for developing policies for Federal support of R&D and of science, engineering and technical personnel with the OSTP.

H.R. 1243, introduced by Rep. George Brown. To require the Director of the OSTP to enter into an agreement with both the National Academy of Sciences and the National Academy of Engineering to conduct a study which identifies economically strategic technologies and plans for their optimal development.

H.R. 1699, introduced by Rep. Perkins, would have declared that primary responsibility for developing policies of Federal support of R&D and of science, engineering, and technical personnel lies with the OSTP.

H.R. 4192, introduced on Oct. 21, 1983, by Rep. Ritter. It would have given the director of the OSTP responsibilities to evaluate and publish notice of the findings of risk assessments undertaken by the National Academy of Sciences.

H.R. 4186, introduced Oct. 20, 1983, which would have established a National

H.R. 2164, introduced Apr. 23, 1987 by Rep. George Brown, to create a Department of Science and Technology which would incorporate the functions of the Office of Science and Technology Policy.

H.R. 3048, the National Superconductivity and Competitiveness Act of 1987, introduced by Rep. McCurdy, July 29, 1987, which among other things would create a commission to collaborate with the OMB and the OSTP in developing a research program for superconductivity.

H.R. 3127, National Superconductivity and Competitiveness and National Security Act of 1987, introduced by Rep. McCurdy, Aug. 7, 1987, which among other things would require the OSTP and the OMB to collaborate with the National Commission on Superconductivity and the National Critical Materials Council to develop a five-year superconductivity research program.

S. 752, the National Space Grant College and Fellowship Act, introduced Mar. 17, 1987 by Sen. Bentsen. It would require the OSTP and the OMB to review annual reports prepared by the national space grants college and fellowship program created in NASA.

H.R. 3228. Department of Energy authorization bill, introduced by Rep. Roe, Aug. 7, 1987. To require the Director of OSTP to include a financial plan regarding Federal civilian science facilities and programs within the budget justification documents.

The following list contains similar legislation introduced during the 99th Congress:

S. 2594, the Supercomputer Network Study Act, introduced by Sen. Gorton, to require OSTP to report to Congress on fiber optics networks and other options to improve communications between U.S. supercomputer centers and users.

H.R. 744, the Information Science and Technology Act of 1985, introduced Jan. 28, 1985 by Rep. George Brown. Among other things it would have provided for a Special Assistant for Information Technology and Science Information in

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Critical Material Council in the Executive Office of the President, which among other things would assist the OSTP in preparing long-range materials assessment and reports.

H.R. 4628, the National Educational Software Corporation, introduced on Jan. 24, 1984, by Rep. Gore. It was proposed that one of the directors would be the director of the OSTP.

H.R. 5003, introduced Mar. 1, 1984 by Rep. Fuqua, which would have revised the patent law to establish uniform policies and procedures regarding patent rights and inventions developed with Federal assistance and require the FCCSET to report to the director of the OSTP regarding uniform patent policies.

S. 428, introduced Feb. 3, 1983 by Sen. Tsongas, to require that the Director of the OSTP enter into an agreement with the National Academy of Sciences and the National Academy of Engineering to conduct a study which identifies economically strategic technologies and plans for their optimal development.

the Office of Science and Technology Policy and would have established the Institute for Information Policy and Research and a National Information Science and Technology Board.

H.R. 3869, which set forth a national space and aeronautics policy, introduced Dec. 5, 1985 by Rep. Dornan. Directed the directors of NASA and OSTP to present Congress with a 30 year plan, including research and development objectives for a comprehensive national civilian space and aeronautics policy.

H.R. 4452, introduced Mar. 19, 1986, by Rep. Fuqua, would have established the Biotechnology Science Coordinating Committee and the Biotechnology Science Research program within the office of Science and Technology Policy.

S. 1967, introduced Dec. 17, 1985 by Sen. Durenberger. Would have created a permit program in EPA to regulate use of genetically engineered microorganisms and established a Biotechnology Science, Coordinating Committee within the Federal Coordinating Council for Science, Engineering and Technology to serve as a forum for evaluating potential adverse effects on human health or the environment caused by such organisms.

S. 2594, introduced June 24, 1986 by Sen. Gore. Directed the OSTP to study critical problems and current and future options regarding communications networks for supercomputers at universities and Federal research facilities in the United States.

J. ISSUES RELATED TO STATURE OF DIRECTOR AND STATUS OF THE OFFICE WITHIN THE EXECUTIVE OFFICE OF THE PRESIDENT

After the first OST was abolished by President Nixon, the point was made that the President would use a scientific advisory office only if he had rapport and trust with the advisory staff and that a scientific advisory office should not be forced upon a President.[39] Such considerations appear to have been taken into account in the 1976 act since it created a scientific advisory office in the executive office of the President and a Director of the office, but it did not include provisions for a statutorily created science advisor or a scientific advisory committee. Thus, the President was left with the option of naming the director as science advisor. Both Presidents since 1977 have done so. This flexibility undoubtedly enables the President to form an advisory team composed of persons who share his views. But it may also create the potential for advice premised on only a narrow partisan perspective.

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[39] Beckler, David Z. The Precarious Life of Science in the White House. Daedalus, summer 1974. p. 115-134. See also: Golden, William T., ed. Science Advice to the President. New York, Pergamon Press, 1979. 256 p.

It seems clear from the criticism directed at President Reagan's science advisors that both have shared his political views,[40] and that they have been dependent upon the President's counselors for access to the President.[41]

Specifically, Dr. Keyworth was criticized for being too conservative;[42] too much of a team player, thereby not being a generator of new ideas;[43] and too outspoken with the press.[44] "Keyworth," it was noted "has been a strong leader of OSTP and has defined the office's role clearly as one that is to support policy handed down from above."[45] This pattern of being the President's spokesman to the scientific community, rather than being the representative of the scientific community to the President, clearly was different from historical patterns in which the science advisor was said to have used the office primarily to provide an opportunity and means for science to be used for policy making:

> Keyworth's tenure as a White House adviser was controversial. From the outset he reversed the traditional role of White House science adviser. Previous occupants of the office have functioned chiefly as conduits into the White House for the scientific community. Keyworth

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[40] For instance Dr. Keyworth was repeatedly criticized for his fervent endorsement of the strategic defense initiative; Dr. Graham has been criticized for a conference on commercialization of superconductivity, which was open to attendance by Americans only, but which, it was reported, foreign reporters were permitted to attend. See: White House Science Office Draws Gloomy Reviews. Science and Government Report, Aug. 1, 1987, p. 8. Matlack, Secretive Salesman. National Journal, Aug. 29, 1987.

[41] Norman, Colin. The Making of a Science Adviser. Science, v. 218, Nov. 12, 1982. p. 658.

[42] Smith, op. cit.

[43] Lepkowski, Nov. 26, 198[illegible], op. cit.

[44] Lepkowski, Wil. Organization, Personnel Changes Hamper Two Top Science Agencies. Chemical and Engineering News, Oct. 17, 1983. p. 17.

[45] Marshall, Elliot. Keyworth Quits White House Post. Science, v. 230, Dec. 13, 1985. p. 1251. See also: Perry, Tekla S. Keyworth at Mid-Term. IEEE Spectrum, Aug. 1983. p. 55.

> saw himself as a member of the President's team, not as a member of the science community.[46]

Keyworth's credibility was sometimes questioned as when he ". . . forcefully defended Presidential projects, such as building a space station, which he initially opposed."[47] It has been commented that he ". . .supplied the ever curious science policy community with a portrait of thorough ideological integration between one science adviser and the White House staff."[48]

It is apparent that the OSTP Director's perception of his primary function of serving the President and of interpreting the President's views to the scientific community could be and, in fact, has been, antithetical to the mission that some observers would attribute to OSTP. Thus it is arguable that an advisory office designed to serve the President may not necessarily and simultaneously be the best kind of a mechanism for developing a broad-based, long-range "rational" science policy for the Nation.[49]

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[46] Keyworth: Parting Shots From the White House Science Office. Physics Today, v. 39, Feb. 1986. p. 57. See also footnote 49 below.

[47] McDonald, Kim. Resignation of President's Science Adviser Prompts Speculation Over Future Budgets. Chronicle of Higher Education. Dec. 11, 1985, p. 16.

[48] Lepkowski, Wil. George Keyworth Looks Back on His Tenure As Science Adviser, Chemical and Engineering News, May 26, 1986. p. 7.

[49] Burger, Edward J., Jr. who served in the White House Office of Science and Technology and is author of Science at the White House. A Political Liability (1980) related the fundamental obstacle to effective science advice in the White House to ". . . an inherent conflict between the notion of rational and objective review of national goals and options (that which scientists do well) and the traditional patterns and forces of consensual democracy. . . . Thus, simply recommending the establishment or reestablishment of a Presidential science advisory apparatus as it was thought of in an earlier day will not be sufficient. It is the "President's problem" which must be considered first and foremost. The challenge is not simply to assure a clear separation between advocacy for science ("policies for science") and the application of scientific understanding and principles to the resolution of national problems ("science for policy-making"), although that is an essential feature. The problem is to make the enterprise truly useful to the public policy machinery. . . . In practice. . .pragmatism and short-term features of the office tend to prevail. " (Burger, Edward J., Jr. Commentary: Presidential Science Advisory Apparatus. Science, Technology and Human Values,

Henry Lambright, a political scientist, described this situation as a "paradox in presidential science advice. This paradox is that the influence of a presidential science advisory system requires an independent expertise, while being dependent on the President. It must be apolitical yet responsive to a political executive. The former quality provides credibility; the latter, a means to make that credibility count in policy terms." It worked under Eisenhower because there was a commonality of interests. He defined this as "to counter weapons policies espoused by what Eisenhower called the 'military-industrial complex.'" However, under Reagan it is a ". . . model that puts the premium on the science adviser's skills of maneuver within the White House and Executive Office of the President. Such skills depend to a perilous degree on the play of personality and personal favor among staff personnel. An Ed Meese goes, a Donald Reagan comes, and a George Keyworth's status as science adviser fails."[50]

1. ELEVATE STATUS OF THE OSTP

It has also been suggested that the President would accord more importance to and pay more attention to the work of the OSTP if the science and technology advisory mechanism existed ". . . at the level of special assistant or counselor to the President"[51] and not have to report through a retinue of presidential assistants. Dr. John P. McTague, after resigning as acting science advisor commented: "The linkage with the West Wing is not good, . . .

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v. 11, fall 1986. p. 57-58.)

[50] Lambright, W. Henry. Commentary: The Paradox of Presidential Science Advice. Science, Technology, and Human Values, v. 12, winter 1987. p. 80-81.

[51] Lepkowski, op. cit., July 7, 1986, op. cit., p. 26.

But we have been working well with other staff offices like the Office of Management and Budget and the National Security Council."[52]

Dr. Jerome Wiesner, science advisor under President Kennedy, emphasized the importance of elevating the status of OSTP in a recent article. All science and technology advisors, he said, were appointed at the level of Special Assistant prior to the abolition of the Office and the President's Science Advisory Committee by President Nixon in 1973. The chief advantage of having a science and technology advisor at the level of special assistant, according to Wiesner, were the fact that the office came to be the Presidents' main source of technical information. Free from the advocacy position espoused by particular Federal agencies, the office became the conduit to the President for "whistleblower" type information about problems with Government programs and an "ombudsman for Federal science and technology programs."[53] Wiesner called for revitalization of an independent presidential science advisory apparatus and a President's Science Advisory Committee to provide technical advice to the President. According to Wiesner, the following problems ". . . are directly traceable to the absence of a presidential [science] advisory group":

> The Challenger disaster, the unproven and exaggerated claims about military inferiority and need for excessive amounts of new military technology and hardware, the exaggerated claims of Soviet cheating on arms agreements, the disregard by the responsible agencies of serious environmental and public-health problems and the loss of competitiveness of much of American industry.[54]

One may criticize Wiesner's observations by noting that some of the program failures he noted were rooted in decisions which were made long before the beginning of the Reagan Administration. However, Wiesner made the point regarding advice on technical decisions that President Reagan ". . . uses the buddy system, which in the end, proved disastrous. Reagan has made no effort to get independent advice about technical questions such as the shuttle, or SDI, perhaps because he did not know that he needed it. He trusted the advocates who had surrounded him during his campaign for the presidency, and he heeded their advice."[55]

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[52] Rheem, Donald L. Acting Science Adviser Quits; Some Lament Post's Lost Influence. Christian Science Monitor, May 17, 1986. p. 6.

[53] Wiesner, Jerome B. Why We Need a Tough National Science Adviser. The Washington Post, May 24, 1987. D4.

[54] Wiesner, May 24, 1987, op. cit., p. D1.

There is little or no evidence to evaluate this assertion. The committee may wish to consider whether there is an absence of independent technical advice to the President via OSTP and whether this jeopardizes presidential science decisions.

2. PROPOSAL TO MAKE OSTP DIRECTOR A CABINET MEMBER WITHOUT PORTFOLIO

In a January 1988 interview, Dr. Frank Press, President Carter's science advisor, reported that the issues faced by a science and technology advisor ". . . are now so paramount that this person has to be a member of the cabinet without portfolio, without a big department. Or the person should be a full Assistant to the President. . . . A full Assistant to the President has prerogatives that are quite different. He or she can walk into any meeting, can get involved with any issue. A member of the Cabinet without portfolio can do the same. I say without portfolio because I'm not enthusiastic about putting a Department of Science behind him."[56]

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[55] Wiesner, op. cit., p. D4.

[56] R and D Policy After Reagan: First of a Special SGR Series. Science and Government Report, Jan. 15, 1988. p. 4.

When he was questioned about elevating the status of the office, George Keyworth said that he said his standing in the White House hierarchy was entirely appropriate because:

> . . .One's ability to function depends upon one's personal relations entirely. Rank has little to do with it. My rank is technically the same as Ed Meese's was when he was at the White House. My position and importance have to do with whether the person elected to serve in the White House wants to use his science adviser as a counselor.

Keyworth also dismissed the need for his position to be raised to cabinet rank[57] on the grounds that

> The number of people who sit in a cabinet meeting is large. In my first two years, I spent a tremendous amount of time and effort support[ing] the Cabinet Council process [at sub-Cabinet-level policy discussions], and I would say that I've probably gotten a lot more done in the last couple of years when I have been forced to spend an awful lot more time on other issues, like SDI.[58]

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[57] In the past, several news articles said that the OSTP's future is "in jeopardy." (Smith, R. Jeffrey. The Knives Are Out for OSTP. Science, v. 226, Dec. 21, 1984. p. 1399-1400; Keyworth: After the Ouster Rumors, a Second Term. Science and Government Report, v. 15, Jan 15 1985. p. 1-4.) It has been reported that if a Department of Science and Technology were to be created, as proposed by the President's Commission on Industrial Competitiveness, the cabinet secretary for science and technology would assume the functions of the director of the OSTP and the President's science and technology advisor. (White House and Science: Idea of Cabinet Department Revived. Chemical and Engineering News, Nov. 19, 1984. p. 6-7; Cabinet Council to Debate Creating New "Industry Oriented" Science Dept. Inside the Administration, Dec. 21, 1984. p. 12; Broad, William J. Science Department in Cabinet Is Urged. New York Times, Dec. 11, 1984. p. C1-C2; Norman, Colin. A New Push for a Federal Science Department. Science, v. 226, Dec. 21, 1984. p. 1398-1399; and Koshland, Daniel E. Jr. A Department of Science? Science, v. 227, Feb. 8, 1985. editorial.) There were reports that Dr. Keyworth sought to become the first Secretary of science and technology. (Lepkowski, Wil. Peers Rate Keyworth Generally High as President's Science Adviser. Chemical and Engineering News, Nov. 26, 1984. p. 9.)

[58] Keyworth: Parting Shots From The White House Science Office. Physics Today, Feb. 1986. p. 60.

K. STANDING OF THE OSTP DIRECTOR IN THE SCIENTIFIC COMMUNITY

Other criticisms have focused on the possibly inappropriate backgrounds and relatively low prestige among the science policy community of recent science advisors. It has also been noted that the OSTP, especially under the Reagan Administration, seems uninterested in ". . . restoring the status of the position to anything near its past influence. That may be the key to why more prestigious individuals have turned offers down [to be named OSTP director]."[59] Dr. Keyworth's directorship and early tenure were viewed with skepticism by some of his fellow scientists because of his youth and relative inexperience--he was 42 when appointed and was most recently employed as Physics Division leader at Los Alamos National Laboratory. As noted above, some leaders of the scientific community were at first dissatisfied with early Reagan Administration decisions to cut basic science funding which they attributed to Dr. Keyworth. But, later after the Administration started to increase funding for science and especially for basic research, many of these former critics came to applaud Dr. Keyworth's efforts to raise research and development budgets. Nevertheless, some opposition to Dr. Keyworth continued based on his ". . . unflagging enthusiasm for the President's proposal to defend the nation against a ballistic missile attack, popularly known as the 'Star Wars' plan"[60] and by those who disagreed with the recommendations or views which resulted from studies sponsored by his office. One example given for instance focuses on objection to a White House science office task force report that ". . . recommended prompt action to limit acid rain."[61]

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[59] Lepkowski, Wil. New Presidential Science Adviser Will Face Complex Issues. Chemical and Engineering News, July 7, 1986. p. 26.

[60] Smith, R. Jeffrey. The Knives Are Out for OSTP. Science, Dec. 21, 1984. p. 1399.

It was reported that after Keyworth resigned, efforts were made by William Carey, executive director of the American Association for the Advancement of Science, and "by several other prominent scientists who urged the appointment of a 'world-class scientist' who could draw upon the wisdom of experts outside the government in helping the President evaluate the recommendations and proposals pushed by Federal agencies." [62] Reportedly several well-qualified individuals rejected the offer to become Director of OSTP. The same kind of skepticism that surrounded Keyworth nomination was evidenced about Dr. Graham:

> William R. Graham is truly the most unknown of all the science advisers nominated by any President. He is 49 and has been deputy director of NASA for hardly six months. As a scientist he is unknown because his entire career has been spent working in that so-called "black" area of science and technology--military systems.[63]
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> . . .Graham's entire career has been spent on highly classified research on the physics and engineering of electromagnetic fields related to nuclear explosions and their effects on electronic command and control systems. So almost no one in the academic community knows who Graham is and whether he is fit by background, inclination, or philosophy to argue the many issues that concern, education, and innovation in the country.[64]

Although he was confirmed, Dr. Graham's appointment was criticized by the press and in Congress:

> Rejected for a full-fledged appointment as the person to rebuild NASA, Graham was given a consolation prize-the post of Science Adviser to the President, vacant and unwanted by a ny reasonable prospect since George A. Keyworth II had stepped down at the end of 1985. Graham's Senate confirmation hearing produced three negative

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[61] Smith, Dec. 21, 1984, op. cit., p. 1399.

[62] Kirschten, Dick. Help Wanted, But Do They Seek. National Journal, v. 18, May 31, 1986. p. 1328-1329.

[63] Lepkowski, July 7, 1986, op. cit., p. 23.

[64] Ibid., p. 24.

votes in committee, the only nays ever cast since the Presidential advisory post became subject to Senate confirmation 25 years before . . . .[65]

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[65] House Committee Weighs Inquiry on Reported Disarray in OSTP. Science and Government Report, Oct. 15, 1987. p. 3.

L. PROPOSALS TO RESTORE A PRESIDENT'S SCIENCE ADVISORY COMMITTEE

Discussed next are three kinds of proposals to augment scientific and technical expertise in OSTP.

1. WHITE HOUSE SCIENCE COUNCIL

The establishment of the White House Science Council (WHSC) in 1982, chaired by Dr. Solomon J. Buschbaum of Bell Telephone Laboratories, represents an initiative not mandated by P.L. 94-282. Although its work appears to be prospective and to have dealt with major policy issues, the actual effectiveness of the Council could be examined.[66] There is little public information available regarding the Council and its activities. Since it is advisory to the Director of OSTP, its members are not subject to congressional nomination procedures, thus there has been little public oversight of the WHSC. Criticisms of WHSC embody the following points: it is not an effective forum for, or representative of, national science policy concerns because it is advisory only to the Director of OSTP, not to the President (as PSAC was);[67]

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[66] See for example: White House Establishes a Science Council. Science and Government Report, v. 12, Mar. 1, 1982.

[67] "It consists of able people, several of them quite prominent. [The director of OSTP] uses it in a limited way, so some of the members tell me. He presents questions to it; he listens to it; he uses it as a sounding board. That Council is a useful device, but it is essentially an anonymous group that has neither the stature of Presidential appointment nor the responsibility outright of reporting to the President." (Remarks of William T. Golden. President's Science Advisory Committee Revisited. Science, Technology and Human Values, v. 11, spring 1986. p. 1.)

its members are not appointed by the President but ". . . serve at the pleasure of the science advisor".[68] It is composed primarily of physicists, and does not represent the full spectrum of national science and technology issues.

The Council has created panels to deal with major issues affecting particular Federal agencies. It also has looked at major programmatic and policy issues which cut across agency responsibilities. For instance, panels worked on the subject of the national airspace system, Federal laboratories (Packard panel), future military technologies, university research funding, and special nuclear materials.

The question remains about whether the White House Science Council is an appropriate scientific advisory mechanism. Should the advice to the Director of OSTP provided by the White House Science Council be augmented or replaced by a presidential level scientific advisory committee?

2. PSAC

Some observers attribute the alleged decline in OSTP's ability to initiate comprehensive national science policies to the absence of an independent President's Science Advisory Committee (PSAC). For example, William T. Golden, in 1984, proposed again the creation of a President's Science Advisory Committee, composed of scientists not employed by Government to provide the kind of independent advice and views that the President purportedly did not receive from his science advisor or the White House Science Council.[69]

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[68] Posture Hearing With the Science Adviser, op. cit., p. 107.

[69] Lepkowski, Nov. 26, 1984, op. cit., p. 132. Golden, William T. PSAC: Reestablish It Now. Science, v. 210, Oct. 10, 1984. editorial.

As noted above, Jerome B. Wiesner, science adviser to Presidents Kennedy and Johnson, blamed many of today's major national technical weaknesses to the absence of a strong science advisory system:

> It may be sheer coincidence but the disintegration of the U.S. space program, sliding from a position of world leadership to one of embarrassment, has paralleled the decline of presidential science advising [and forced us to look to European and Soviet launches for scientific and commercial payloads].
>
> Meanwhile, much of U.S. industry, both low and high tech, has gradually slipped out of competitive range of industries in other nations, most notably in price, but often in quality as well. And this turn of events has occurred despite U.S. research activities remaining among the world's best.
>
> The demise of the President' s Science Advisory Committee parallels a growing U.S. tendency to disregard inconvenient facts in arriving at decisions.[70]

Similarly Hans A. Bethe and John Bardeen, professors emeritus of physics at, respectively, Cornell University and the University of Illinois, argued that

> since 1972, scientific advice to the United States Government has been remarkably haphazard. For that and other reasons, the nation is embarked on vast programs based on the misconceptions that we have an unlimited supply of scientific talent and that there need be no relationship between cost and benefit.[71]

They described the benefits of the PSAC, "composed of prominent scientists and engineers whose appointments were not correlated to Presidential elections. This system provided advice relatively uncontaminated by personal ambition and political bias."[72] They gave numerous examples of its initiatives and opportunities for similar kinds of advice today:

> [the] . . . committee played a crucial role in many national security initiatives, including establishment of the post of director (now under

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[70] Wiesner, Jerome B. Why We Need a Tough National Science Adviser. Washington Post, May 24, 1987. D1.

[71] Bethe, Hans A. and John Bardeen. Back to Science Advisers. New York Times, May 17, 1986. p. 27.

[72] Ibid., p. 27.

> secretary) of defense for research and engineering, and also the Defense Advanced Research Program Agency. It supported the development of missile-carrying submarines, ... It fostered innovations that led to surveillance of the Soviet Union by planes and satellites, and it started the research that led to today's excellent capability to detect underground nuclear weapons tests.[73]
>
> The Strategic Defense Initiative provides a telling example of what can happen when a technology program is launched without proper technical advice. President Reagan's "Star Wars" speech was prepared without consultation with experts in the Pentagon or his own science adviser, George Keyworth, until only a few days before the speech was given. And while the White House Science council had a panel examining related technologies, and had met five days before the speech, it was not consulted.[74]

They concluded that "If we are not to commit further follies, we shall have to recreate a scientific advisory system that has sufficient independence and prestige to give advice that is politically unpalatable."[75]

A counter argument to these notions, of course, is that it when enacted P.L. 94-282 which created the OSTP, the Congress determined that it should not impose an advisory mechanism on the President, but that it would give the President ample flexibility to form a mechanism that suited his needs to ensure his using it. As events under Presidents Johnson and Nixon demonstrated, there is no assurance that a President will heed the advice of a PSAC. Effective communications and advice depend on trust, confidence, and shared values.

3. PROPOSAL TO CREATE A PUBLIC NEW SCIENCE ADVISORY APPARATUS

Two science policy analysts, Thomas Ratchford and William Wells, recommended an alternative: the creation of a new public advisory body, the New Science Advisory Apparatus (NSAA). ". . . [T]he United States needs a surrogate for PSAC in the public sector, a focal point for the scientific and engineering community that will bring the interests, concerns and talents of the mainstream scientific and engineering communities to bear on public policy topics of current important in an organized way." Among the issues to address would be ". . . those related to priorities within the United States and global scientific and technological communities, such as R&D funding priorities. . ., issues from the public policy arena, such as the efficacy of R&D tax credits, the role of science and technology in U.S. policies toward the developing world, or the development of an inherently safe and economic nuclear reactor. In between, spanning the spectrum between these two types of issues are hybrid topics, such as export controls, which relate to priorities both within and outside of the world of organized science and engineering." [76]

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[73] Bethe and Bardeen, op. cit., p. 27.

[74] Ibid., p. 27.

[75] Ibid.

"The sponsors of this New Science Advisory Apparatus," they said, should be the mainstream engineering and scientific community, for instance, the "American Association for the Advancement of Science (AAAS) in partnership with many of its almost 300 affiliated scientific and engineering societies and State academies of science. However, they added that there are worthwhile other options, such as:

> an ad-hoc group of scientific, engineering and public interest organizations; the National Academies of Sciences and Engineering and the Institute of Medicine; or a partnership of the Industrial Research Institute and the major R and D universities as represented by the Association of American Universities (AAU) and the National Association of State Universities and Land Grant Colleges. . . . [77]

They proposed a "hierarchy of activities" for NSAA that would include:

> . . . once or twice a year a large assembly of scientific and engineering community leaders and others who would meet to discuss the state of science, technology, and national policies; to review

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[76] Ratchford, J. Thomas and William G. Wells. Commentary: Science Advising--Something New for the Short Term. Science, Technology, and Human Values, v. 12, Winter 1987. p. 78.

[77] Ibid., p. 78-79.

> the work of NSAA and its working groups; and to identify policy issues within and outside the community. . . .[78]

Questions that could be raised about this proposal include: How would it differ from the advisory services provided by the National Academy of Sciences and its related bodies? It appears to be very difficult even for the prestigious scientists who are members of the National Academy of Sciences to reach consensus on priorities. What mechanisms would the NSAA institute to facilitate such kinds of decisions?

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[78] Ibid.

H. INTERAGENCY COORDINATION

Another criticism of the Office of Science and Technology Policy focuses on its alleged inability to effectively initiate and coordinate interagency programs. However, the OSTP engages in both informal and formal coordination activities.

1. INFORMAL COORDINATION MECHANISMS

The OSTP Director says that the office "takes an interest in all issues involving science and technology that should come to the President's attention. Those include international science and technology agreements at the Presidential level and may involve questions of technical cooperation with our allies and with other countries." Furthermore:

> Because it is necessary for the government to understand what the President's intentions are, we tend to initiate the interagency process of developing consensus and coordination on various issues. So we get involved in the process through activities that we initiate, or that the National Security Council initiates; we work closely with the Department of State, and of course within the Cabinet processes. And in the economic sphere we work with the Department of Commerce and the Trade Representative. I was a member of . . . Secretary Malcolm Baldrige's delegation to the U.S.-Chinese Joint Cooperative Commission on Trade and Industry in late April. And I led the U.S. delegation to the general commission on cooperation in science nd technology . . . .[79]

OSTP attempts to coordinate agency activities though its work on budgets and by using an interagency coordination approach, both informally, and via the Federal Coordinating Council for Science, Engineering, and Technology, which is chaired by the Director of OSTP. During his confirmation hearings, current OSTP director William Graham stressed the importance of interagency coordination:

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[79] Science Adviser William Graham Focuses on Global Aspects of Issues. Chemical and Engineering News, Aug. 14, 1987. p. 16.

> OSTP, in conjunction with OMB, will give the higher funding priorities to those interagency programs that are well- planned and effectively implemented. The participating agencies must clearly recognize this and thus provide the necessary management attention and scientific personnel to the interagency programs to have them do well in the budgetary process.[80]

OSTP officials also say the office attempts to point out areas of overlap or potential for cooperation to specific agencies. For instance, in discussing the balance between civilian and defense research, the science advisor testified that there is no requirement for a balance between civilian and defense R&D. But coordination occurs, for example:

> For major defense-related initiatives, OSTP reviews the pertinent technology base at the time of program budget reviews. If discrepancies or potentially constructive synergies are discovered, these are brought to the attention of the agency protagonists. Competitive approaches to eliminate or to reduce technical risks are explored, compared, and selected to be part of the mainstream programs.
>
> The implementation and congressional support of the [University Research Initiative] URI received the particular attention of OSTP.[81]

2. FEDERAL COORDINATING COUNCIL ON SCIENCE, ENGINEERING, AND TECHNOLOGY

The Federal Coordinating Council on Science, Engineering and Technology (FCCSET) replaced the Federal Coordinating Council for Science and Technology (FCST). FCST had been established by executive order in 1959. P.L. 94-282 abolished it and replaced it with FCCSET, which has similar but more modest functions. FCCSET was established by P.L. 94-282 "to deal with science and technology policy issues affecting more than one Federal agency." The Director of OSTP chairs FCCSET. OSTP also functions to ". . . identify the best possible chairpersons, members, and staff for . . . interagency committee under. . . [FCCSET].[82] According to Dr. Graham, funding for FCCSET activities ". . . comes from participation and consideration of the individual agencies. . . . Each agency tends to provide its own funding for these activities."[83]

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[80] Nominations--September--October, op. cit., p. 26.

[81] Posture Hearing With the Science Advisor to the President, op. cit., p. 110-111.

OSTP reported that the active committees of FCCSET in FY86 dealt with:

Atmosphere and Oceans

Biotechnology Science Coordinating Committee

Food, Agriculture, and Forestry Research

Human Subjects

Materials

Radiation Research and Policy Coordination

Solar-Terrestrial Research

Supercomputers

In addition OSTP reestablished a Committee on International Science, Engineering, and Technology (CISET), renewed for another five years the charter of the FCCSET Committee on Atmosphere and Oceans, and reaffirmed chairmanship by the Administrator of NOAA, and initiated a reorganization of the Committee on Supercomputers.[84]

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[82] Nominations--September--October, op, cit., p. 26.

[83] U.S. Congress. House. Committee on Appropriations. Dept. of Housing and Urban Development--Independent Agencies Appropriations for 1988, op. cit., p. 574.

[84] Ibid., p. 604-605.

The activities of the Federal Coordinating Council for Science, Technology and Engineering have not been inventoried in a public document since 1980,[85] but some of its recent activities have been described in hearings and in the press. Recent activities relate to development of policies to govern Federal research and policy for acid rain, supercomputers, biotechnology, intellectual property rights, materials policy, science and mathematics education, and radiation research. There are views that the "FCCSET. . . is underused," [86] and that the recommendations of the interagency committees under FCCSET have sometimes been suppressed or not implemented because of conflicts with the Administration's policies. But such allegations would need to be examined.[87]

FCCSET activities tend to focus on development of policy that affects more than one agency. Included next is an example of FCCSET activities in materials policy:

> In accordance with the requirements of the National Critical Materials Act (P.L. 98-373), OSTP has cooperated with the National Critical Materials Council through the FCCSET mechanism, specifically the Committee for Materials (COMAT). COMAT has continued in its role of coordinating advanced materials research and development between the agencies, and has worked with the Council in this area. The Council is currently engaged in the development of an overview of the budget and materials programs at each of the agencies. [88]

The composition and activities of the FCCSET international committee were described as follows:

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[85] U.S. Office of Science and Technology Policy, Executive Office of the President. Federal Coordinating Council for Science, Engineering and Technology. Activities: 1976-1979. Washington, U.S. Govt. Print. Off., 1980, 55 p. U.S. Office of Science and Technology Policy. Executive Office of the President. Federal Coordinating Council for Science, Engineering, and Technology. Activities 1980. Washington, U.S. Govt. Print. Off., 1980. 38 p.

[86] Q&A With NAS President Frank Press. R&D Policy After Reagan: First of a Special SGR Series. Jan. 15, 1988. p. 5.

[87] See for example: Sun, Marjorie. Acid Rain Report Allegedly Suppressed. Science, v. 225, Sept. 21, 1984. p. 1374.

[88] Posture Hearings with the Science Advisor to the President, op. cit., p. 90.

CISET's primary purpose is to bring high-level scientific and technical expertise and responsibility in the U.S. government to bear on critical international S&T issues. CISET facilitates integration of U.S. government international S&T activities into the framework of domestic R&D policy and the development of government-wide international S&T policies consistent with the Administration's domestic priorities and budgetary resources. CISET membership, at the level of deputy agency directors and assistant secretaries and above ensures that, for the first time, top governmental R&D policy officials are being called upon to systematically examine the international implications of domestic R&D policies as well as attendant foreign policy and national security considerations. CISET is carrying out its substantive work largely through four working groups chaired by CISET members and comprised of other senior-level agency representatives. These working groups address the issues of:

-- international science, engineering and technology education, infrastructure and facilities;

-- the role of science, engineering and technology in international competitiveness;

-- bilateral and multinational activities;

-- strategic science, engineering and technology cooperation and technology transfer.[89]

It seems clear that OSTP does not seek authority to intervene in interagency disputes using FCCSET. For example, in a question posed at his nomination hearing, Dr. Graham was asked about the difficulty that the Biotechnology Science Board had in serving as a coordinating mechanism regarding regulation of deliberate releases of genetically altered material and the subsequent need to replace the board and create a Biotechnology Science Coordinating Committee. He was asked in this regard if he intended ". . . to seek the authority to arbitrate interagency disputes in regulating deliberate releases of genetically altered substances and organisms." He responded that "Since the authority to arbitrate and resolve disputes between the agencies resides with the Domestic Policy Council, the Cabinet and ultimately with the President, I would not propose such authority for OSTP." However OSTP would

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[89] Ibid., 1987, op. cit., p. 85-86.

". . .monitor events and participate in guiding regulatory policy."[90]

FCCSET seems to be more effective in some areas than in others. The committee may want to further examine the scope and effectiveness of OSTP's informal interagency coordination and of FCCSET activities.

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[90] Nominations--September--October, op. cit., p. 34.

N. OSTP'S COMPLIANCE WITH ANNUAL, FIVE-YEAR OUTLOOK, AND BIENNIAL REPORTS

P.L. 94-282 established two reporting requirements. OSTP was mandated in section 206 to prepare a five-year outlook report describing, first, emerging problems in which scientific and technical considerations play a major role and, second, opportunities for and constraints on the use of science and technology to solve problems. The time horizon was five years, the report was to be revised annually, and its findings were to be considered in the development of the President's legislative and budgetary proposals.

In section 209 of P.L. 94-282, the President was required also to report annually to the Congress' detailing Federal programs and critical policy issues in science and technology and recommendations for legislation to deal with problems identified. The Directors of the OSTP, the National Science Foundation, and other agencies were authorized to assist in preparing the report. Specifically the statute called for the report to discuss such issues as:

(1) a review of developments of national significance in science and technology;

(2) the significant effects of current and projected trends in science and technology on the social, economic, and other requirements of the Nation;

(3) a review and appraisal of selected science- and technology-related programs, policies, and activities of the Federal Government;

(4) an inventory and forecast of critical and emerging national problems, the resolution of which might be substantially assisted by the application of science and technology;

(5) the identification and assessment of scientific and technological measures that can contribute to the resolution of such problems in light of the related social, economic, political, and institutional considerations;

(6) the existing and projected scientific and technological resources, including specialized manpower, that could contribute to the resolution of such problems; and

(7) recommendations for legislation on science- and technology-related programs and policies that will contribute to the resolution of such problems. (Sec. 209 (a) (1) to (7)).

Reorganization Plan No. 1 of 1977, as amended, and implemented pursuant to E.O. 12039, signed on February 26, 1978, effectively transferred to the Director of the National Science Foundation all functions relating to reports that originally were vested in the Director of OSTP.

1. FIVE-YEAR OUTLOOK

The first five-year outlook was presented to the Congress in September 1978. OSTP helped structure the report, prepare draft material, and contributed to the text. Although the original statute specified the preparation of one main report with annual updates, three full fledged multi-volume reports were prepared in 1980, 1982, and 1983 by the National Academy of Sciences and its agencies on contract to the National Science Foundation.[91]

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[91] May 1980: U.S. National Science Foundation. The Five-Year Outlook: Problems, Opportunities and Constraints in Science and Technology, v. 1. 113 p.; v. 2: Source Materials, A Report for the National Academy of Sciences, 672 p. Washington, U.S. Govt. Print. Off., 1980. January 1982: U.S. National Science Foundation. The 5-Year Outlook on Science and Technology 1981, 87 p., Sources: v. I, Outlook for Science and Technology: The Next Five Years: A Report from the National Research Council, 385 p.; Sources: v. II, Policy Outlook: Science, Technology, and The Issues of the Eighties, A Report from the American Association for the Advancement of Science, Social and Behavioral Sciences: A Report From the Social Science Research Council, Federal Agency Perspectives: A Five-Year Outlook, p. 389-854. 1983: The Outlook For Science and Technology, The Next Five Years. v. III. A Report by the Committee on Science, Engineering, and Public Policy of the National Academy of Sciences, National Academy of Engineering, Institute of Medicine for the National Science Foundation. Washington, National Academy Press, Nov. 1982, 190 p. Also published as U.S. National Science Foundation. The Five-Year Outlook on Science and Technology, 1982. Washington, U.S. Govt. Print. Off., 1983, 95 p.

Problems with the five-year outlooks were discussed in the scientific literature and in congressional hearings. Generally, the reports were criticized as being: too long, consisting of a mass of undigested technical information not used by Congress, the primary intended user;[92] too academically oriented, reflecting primarily the views of the scientific community, and not the Office of Science and Technology Policy; too expensive; and ill-suited for policy use. In fact, James G. Ling, former OSTP assistant director of institutional relations, reportedly testified at a congressional hearing that:

> We have no evidence that the Five Year Outlook has forced any high level reassessment of executive branch plans or actions. Certainly it has not proved useful as a means of identifying policy issues for attention of our office. . . . We find that the . . . Outlook . . . lags rather than leads the issues identification and resolution process.[93]

2. ENACTMENT OF P.L. 97-37

Following an extended period of consideration, the Congress enacted P.L. 97-375, December 21, 1982, which abolished the requirement for the five-year outlook as a separate report; returned responsibility to the director of OSTP for preparation of the science and technology report, which was retitled to incorporate the outlook in its title and scope; and required that the report be presented to the Congress every two years.

One additional outlook report was published in 1985. It is a very short report, together with recommendations for congressional action based on the nine subjects that formed the bases of the research briefings provided by the

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[92] See for instance, Cort, H. Russell and Elizabeth C. Cort. The Five Year Outlook on Science and Technology. Views of Users. Prepared for the National Science Foundation Under Contract NSF PRM 8313669. Jan. 31, 1984. 39 p. plus appendices.

[93] Feller, Claudia. Congress Questions Usefulness of Five Year Outlooks. Bioscience, v. 34, Apr. 1984. p. 221.

National Academy of Sciences Committee on Science, Engineering, and Public Policy to the Office of Science and Technology Policy.[94] (This process is described below in this section.)

3. ANNUAL AND BIENNIAL REPORTS

Four annual reports were published prior to the effective date of P.L. 97-375.[95]

The most recent biennial report released by OSTP pursuant to P.L. 97-375 was for the period 1983-1984 and was dated Oct. 24, 1985.[96] The previous report was for 1982 and was dated September 1983 even though the statute specified that it should be presented to the Congress by January 15 of every odd-numbered year.[97] It incorporated some material from the 1983 five-year outlook report (which apparently had been under preparation before P.L. 97-375 was enacted). According to an NSF staff official responsible for preparing some portions of the 1984 Science and Technology Report and Outlook,[98] Federal agency contributions to the 1983 report were finished in summer of 1984 and sent to OSTP, which took no action on the material until December 1984, when it instructed NSF to obtain information from Federal agencies about fiscal year 1985 activities so that it could prepare and release a combined 1983 and 1984 report.

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[94] The Outlook for Science and Technology, 1985. Prepared by the Committee on Science, Engineering and Public Policy, Washington, National Academy of \sciences, National Academy of Engineering, Institute of Medicine, 1985, 50 p.

[95] U.S. National Science Foundation. Science and Technology: Annual Report to the Congress, Aug. 1978. Washington, U.S. Govt. Print. Off., 1978. 57 p.

U.S. National Science Foundation. Science and Technology: Annual Report to the Congress. June 1980. Washington, U.S. Govt. Print. Off., 1980. 87 p.

U.S. National Science Foundation. Annual Science and Technology Report to the Congress, 1980. Washington, U.S. Govt. Print. Off., 1981. 144 p.

U.S. Office of Science and Technology Policy in cooperation with the National Science Foundation. Annual Science and Technology Report to the Congress: 1981. Washington, U.S. Govt. Print. Off., 1982. 169 p.

[96] U.S. Office of Science and Technology Policy. Biennial Science and Technology Report to the Congress, 1983-1984. Washington, U.S. National Science Foundation, 1986. 141 p.

[97] U.S. Office of Science and Technology Policy in cooperation with the National Science Foundation Annual Science and Technology Report to the Congress: 1982. Washington, U.S. Govt. Print. Off., 1983. 139 p.

The last biennial report released in 1985 (for 1983-1984) did not conform to the statute's requirement that it include the ". . . statement of the President's current policy for the maintenance of the Nation's leadership in science and technology." The committee may wish to examine future conformance with this requirement. The former Comptroller General's views about the importance of preparing a presidential statement were heard in congressional testimony on the need for long-term planning for national science policy in 1980.[99]

The National Science Foundation has occasionally published background papers it commissioned to aid in preparing the reports required by P.L. 94-282.[100]

P.L. 97-375 also amended the National Science Foundation Act of 1950 [101] to require that the National Science Board's Science Indicators reports be sent to Congress on January 15 of every even-numbered year, in effect, to alternate with the Science and Technology Report and Outlook. Science Indicator reports have been published biennially since 1972. The first Science Indicators report published pursuant to the new statute, and the seventh Indicators report in the series, which included actual (as opposed to estimated) data through 1984, was released in 1985.[102]

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[98] Interview Carlos Kruytbosch, Feb. 4, 1985.

[99] Brown, Hon. George E. Long-term Planning for National Science Policy. Congressional Record, Aug. 1, 1980. p. H7029-H7030.

[100] U.S. National Science Foundation. Emerging Issues in Science and Technology, 1981. A Compendium of Working Papers for the National Science Foundation. Washington, U.S. Govt. Print. Off., 1982. 77 p.

U.S. National Science Foundation. Emerging Issues in Science and Technology, 1982. A Compendium of Working Papers for the National Science Foundation. Washington, U.S. Govt. Print. Off., 1983. 130 p.

[101] 42 U.S.C. 1863 (j); 64 Stat. 149.

4. RESEARCH BRIEFINGS REPORTS

The Office of Science and Technology Policy established a formal method of seeking advice from the science and technology community in 1982. Dr. Keyworth requested the National Academy of Sciences (NAS) complex, through its Committee on Science, Engineering, and Public Policy (COSEPUP), to develop panels of experts "to critically assess its field and to identify those research areas within the field that were likely to return the highest scientific dividends as a result of incremental Federal investments. . . ." Topics are selected by OSTP and NSF in consultation with the Academy. Six research priority exercises have been published for the 1982, 1983, 1984, 1985, 1986, and 1987 budgets.[103] Effective use of the research briefings has been reported in the press:

> COSEPUP briefings have over the past 3 years had a significant effect on OSTP policy; the . . . Engineering Research Center[s proposal], for example, stems directly from a COSEPUP initiative.[104]

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[102] U.S. National Science Board [of the National Science Foundation]. Science Indicators, 1985. Washington, U.S. Govt. Print. Off., 1985. 314 p.

[103] For the FY 1984 budget: Research Briefings for the Office of Science and Technology Policy, the National Science Foundation, and Selected Federal Departments and Agencies. Washington, D.C., National Academy Press, 1983, 133 p. For the FY 1985 budget: Research Briefings 1983 for the Office of Science and Technology Policy, the National Science Foundation, and Selected Federal Departments and Agencies. Washington, D.C. National Academy Press, 1983, 92 p. For the FY 1986 budget: Research Briefings 1986 for the Office of Science and Technology Policy, the National Science Foundation, and Selected Federal Departments and Agencies, Washington, D.C., National Academy Press, 1986, 116 p.For the FY 1987 budget: Research Briefings: 1987 for the Office of Science and Technology Policy, the National Science Foundation, and other Federal Agencies. Washington, D.C., National Academy Press, 1987, 68 p.

[104] Beardsley, Tim. U.S. Research Objectives: Keyworth's Shopping List. Nature, U.S. and Canada, v. 312, Nov. 22, 1984. p. 296.

The question remains about whether Congress should be provided with research briefings from panels of experts on science when the Office gets them, and whether the implications of such briefings should be assessed in terms of broader resource allocation issues for funding science and technology.

O. BUDGET AND ORGANIZATIONAL ISSUES

Dr. Frank Press, Director of OSTP and science advisor under President Carter, commented that, under his tenure, OSTP had more influence than under President Reagan's science advisors, because, in part, it had a larger budget than the current OSTP [estimates are $2.6 million in 1978 vs. the current $2.1 million in 1988] and because he had " . . . at least 20 staff people right there with me in the Old Executive Office Building. [Keyworth had no more than two.]" [105]

The sizes of the budget and of the staff have received considerable criticism during this administration. There is the belief that OSTP's functioning and institutional memory have suffered because of large-scale personnel turnovers[106] and because many OSTP staff have been detailees from other agencies. OSTP a'so uses staff on loan from outside of the Government.

According to one news report:

> The office's staff was 41 persons at the start of Reagan's second term. There are now 33 persons on board, only 10 of whom are on the White House payroll. Most of the others are on loan from other agencies, which share their salaries on a 50-50 basis.[107]

The Committee for U.S. Competitiveness of the Institute of Electrical and Electronics Engineers criticized the predominance of non-permanent staff at OSTP. It reported that, as of Jan. 28, 1987, "the total number of full-time professionals with the OSTP is 30. Of those 7 are full-time permanent and 23 are on detail from 10 different agencies."[108] It proposed to issue a position statement that competitiveness would be enhanced if the OSTP were strengthened and properly staffed ". . so that it can advise the President about priorities for government funded R&D while being fully cognizant of privately funded U.S. academic and industrial R&D."[109]

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[105] Lepkowski, July 7, 1986, op. cit., p. 26.

[106] House Committee Weighs Inquiry on Reported Disarray in OSTP. Science and Government Report, Oct. 15, 1987. p. 1.

[107] Kirschten, May 31, 1986, op. cit., p. 1329.

As shown in the next table, OSTP's budget has declined from the average reflected during the period 1978 to 1980.[110] The decline would be much sharper if shown in constant dollars. Some argue that this indicates OSTP does not have adequate resources to do its job.

OSTP apparently believes it can fulfill its requirements with an abbreviated permanent staff and a budget about 50 percent below the actual purchasing power of its budget 10 years ago. (This was calculated by converting the data in the table to constant 1982 dollars.) An argument can be made that the OSTP does not need as many staff and resources today as it did ten years ago (if functions and missions have been cut back). However, critics might argue that the science and technology policy issues confronting the Nation today are just as, if not more, demanding than ten years ago, and might warrant equal, if not more, attention at the presidential level.

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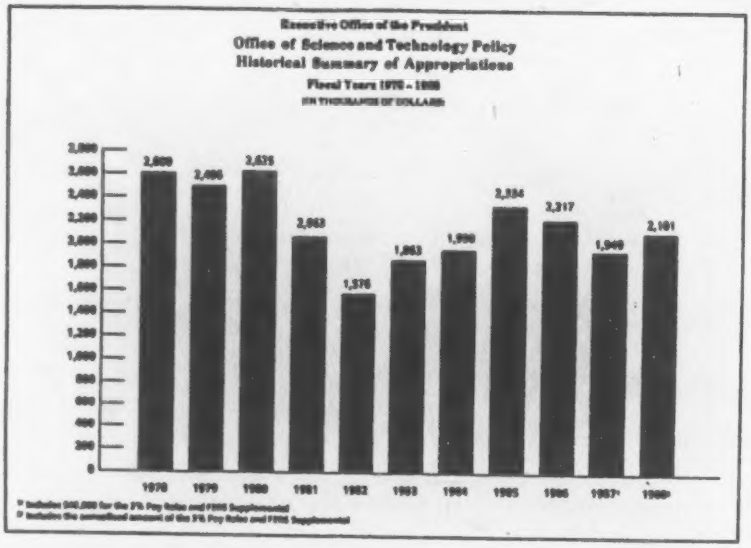
[108] Posture Hearing With the Science Advisor to the President, op. cit., p. 107.

[109] Proposed IEEE Entity Position State. The U.S. Requires a Focus For Its Civilian Science and Technology Policy.

[110] U.S. Congress. House. Committee on Appropriations. Dept. of Housing and Urban Development--Independent Agencies Appropriations for 1988. Hearings, Pt. 4. Washington, U.S. Govt. Print. Off., 1987. p. 584.

TABLE 1



SOURCE: U.S. Congress. House. Committee on Appropriations. Subcommittee on HUD-Independent Agencies. Dept. of Housing and Urban Development-Independent Agencies Appropriations for 1988. Hearings, Pt. 4. 100th Cong., 1st Sess., Washington, U.S. Govt. Print. Off., 1987. p. 584.

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